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THE AMERICAN
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INC.

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Address of the President (Mr. Champ S. Vance) of the Pacific Coast Gas Association, Long Beach, Cal.

Gentlemen: I welcome you to the 22nd annual convention of the Pacific Coast Gas Association. My first duty is to thank you for the confidence you reposed in me last year in making me your President. I have tried to the best of my ability to prove myself worthy of the honor bestowed upon me, and hope I have succeeded in discharging my duties to your satisfaction. If I have failed it is not because of lack of loyalty and support on the part of the members of the Association.

We assemble here to review the events of the past year in the gas industry and in our Association; to benefit each other, our companies and the consumer, by imparting information we may have on subjects of mutual interest. When a group of men meet to discuss the progress of the particular business in which they are interested, each individual is bound to benefit thereby, and I sincerely hope that every member of the Association present at this convention will take away with him some practical knowledge that will be of value to him and to the company which he represents. To this end I urge that all take an active part in the proceedings.

The past year seems to have been one of many bringing out unusual developments in our chosen industry. A number of us have had to contend with rate settlement; compensation laws more than held interest; and the advent of natural gas in some parts of California caused and is causing considerable thought and study. Generally speaking, the year ending will go down in history as one replete with sensations. Judging from the practice of some of the larger companies, there seems to be a commendable activity toward the complete establishment of a standard gas oil best suited for the purpose. It is gradually being recognized that an out and out crude oil oftentimes leaves much to be desired, and topping of crude oil is slowly but surely coming into favor. Blending of gas and fuel oils is also being resorted to, and it has been shown that this practice has merit, and in many cases the result is an excellent grade of gas oil, amply capable of producing a product well within different city regulations. Right here it may not be amiss to add that this is a matter which could profitably be studied, one well worth the effort, and I hope to hear from a number of you and of your success along these lines at our next meeting. Carbon by-product made into a finished commercial fuel seems to be coming into favor generally. Its excellent quality is being recognized by the consumer to such an extent that it is within reason to predict that "Old King Coal" (in California at least) will soon be routed. There is an inclination on the part of manufacturers to dispose of at least some of this fuel through local tradesmen, thus insuring an even distribution during the heavy winter demand. Further, it is an excellent advertising medium, and aids in the solution of the storage problem, where storage space is at a premium.

Numerous new gas appliances of greater or less merit seem to have become very prominent. It certainly behooves the appliance men, as well as the gas men, to make an investigation of all these and concentrate efforts upon such as they are assured will best serve the customer.

Since our last meeting there has been placed upon the statute books of California a new law far reaching in its consequences, and of especial interest to the gas companies and other public utilities of the State. I refer to the so-called Workmen's Compensation, Insurance and Safety Act. This act, in its nature altruistic and designed for the better protection of the workman, establishes a principle of compulsory compensation for industrial accidents; takes from the employer coming within its provisions the question of the compensation to be made in cases of personal injury to or the death of an employee in the course of his employment, and places such matters in the hands of a board known as the "Industrial Accident Commission." Upon schedules prescribed by the act, the extent of the injury as regards the disability of the injured employee or his death, is corelated with his earning power, expressed in terms of average earnings, and certain fixed sums are prescribed, adaptable to each individual case, to be payed to the injured employee or to his dependents in installments or as a lump sum. The act further creates a state compensation insurance fund to be administered by the Accident Commission for the purpose of insuring employers, at their option, against liability for compensation thereunder, and provides for the making and enforcement of safety rules and regulations applicable to employers. The act is not without its faults, and serious ones, which should be remedied. It bears more heavily upon the small employers and the poor man than upon the large corporations and the men of wealth. For instance, section 30 places upon the principal the liability for injury to the employee of the independent contractor. This might result in saddling upon a poor man who desired to build a cottage at a cost of not exceeding two thousand dollars, perhaps, the entire liability for the permanent disability of an employee of the carpenter who contracted to build the cottage. This will inevitably have the effect of

driving the poor contracting carpenter or the small contractor out of business in favor of the larger or wealthier corporations or contractors. The act has the effect of abolishing one class of damage cases and jury trials, except where the injury or death is caused by the personal gross negligence of the employer, an elective officer in the case of a corporation, and will result in the prescription and adoption of certain safety standards and devices. Practically, it will resolve itself chiefly into the matter of a slight increase of operating expenses for insurance, and greater vigilance in the observance of the safety-first doctrine. Many large corporations will, of course, be their own insurers.

While the increase in membership in our Association during the past few years has been gratifying, we must not rest content with what has been accomplished in this connection. When we consider the number of gas companies operating on the Pacific cost and note the small proportion of them represented in our organization, we are confronted with the urgent need of missionary work. If the companies not now represented in our organization could be made to realize the benefits to be derived from membership, I am sure that they would have no hesitancy in joining. It cannot be claimed that the expense connected with the membership prevents them enrolling with us, for the dues are insignificant and the annual cost of sending represertatives to the convention is small. Men attending these conventions cannot fail to increase their knowledge of the progress in the manufacture and distribution of gas, by the interchange of thoughts on these subjects. The advantages to be gained by affiliation with an association such as ours are so apparent that a review of them would be superfluous, but I should like to call your attention to the particular advantage to be derived from the attainment of the objects of our organization, as set out in Article II, of our By-Laws, as follows:

1. Its object shall be the promotion and advancement of the gas industry, and all matters relating to the construction and management of gas works and the manufacture, distribution and utilization of gas.

2. To establish a spirit of fraternity between the members by social intercourse and exchange of information; the extension of more cordial and friendly relations between gas companies and their consumers; and to facilitate the education of employees of gas companies to enable them to better perform their duties.

I note that the Secretary has issued a general appeal to the members requesting the active co-operation of each in securing at least one new member before the Gas Congress meets in San Francisco next year, and I trust that every member will put forth his best efforts in this direction, and that the result will exceed our expectations, namely, 500 members by the time mentioned. While realizing that this is an excellent method of securing additional members, I believe that we should begin a systematic campaign of recruiting, and I suggest that a committee be appointed, whose duties shall be to get in touch with every gas man on the Pacific coast, who is not now a member of the Association but eligible to membership, explain to him the objects and advantages of the Association, and invite him to join it. The men composing this committee should be particularly fitted for this work, and capable of explaining the merits of the Association in an intelligent manner. It is only by a constant increase in membership that we can hope to advance the interests of our organization, for the greater the number it reaches the more effective it becomes. I hope that the time is not far distant when every gas company on the Pacific coast will realize the value of our annual meetings and will have at least one representative in attendance at our conventions.

In 1905 our Association began to take an active interest in the question of the establishment of a course of Gas Engineering in one of the Pacific coast universities, and at our convention that year a committee was appointed to consult with the heads of the universities regarding the establishment of such a course. The efforts of this committee did not bear fruit until last year, when a course leading to a degree in Gas Engineering was instituted in the University of California. Mr. J. A. Britton will later tell us the results being obtained at the University, and will report what his committee has done since our last convention.

Just a few words regarding the International Gas Congress. The year 1915 should mark an epoch in the history of our Association. We have agreed to act as host to what is hoped to be the greatest gathering of gas men ever held in this or any other country. Efforts have been made to have as many gas associations as possible hold their meetings in San Francisco during the week of the Gas Congress, and we hope that they will all find it expedient to do so. Many foreign associations have signified their intention of sending representatives to attend this meeting. We have assumed a big contract, and to successfully perform it we must have the aid and co-operation of all our members. I am sure that the committee in charge of this matter will appreciate any suggestions or assistance offered by the members. Mr. J. A. Britton, Chairman of the committee, has prepared an interesting report on the progress made and I ask that you give his paper your earnest attention.

At our last convention we adopted a rule that all papers to be presented at our meetings be in the Secretary's hands on a date named by him, and that they be printed and copies distributed to the members in advance of the meetings. The carrying-out of this plan should be a source of great satisfaction and benefit to all of us, as it gives each member an opportunity to study these papers and prepare for their discussion. I hope that the gentlemen who prepared papers for this convention have assisted the Secretary by complying with this rule. Each year there is an increase in the number of members who wish to take part in the discussions which follow the presentation of papers, but of recent years, though the number of papers has been held to a minimum owing to the lack of time, some of these gentlemen have not had the privilege of being heard. Also, it is only fair to the authors that their contributions, on which they have spent much time and labor, receive thorough and careful consideration; but we have found this almost impossible in a three days' session. Therefore, we have arranged to have the convention this year extend over a period of four days, and we hope that everyone who cares to, will be afforded an opportunity to give us the benefit of his experience and opinion on the problems presented.

Two of our members were claimed by death since the last meeting, Mr. Geo. S. Colquhoun, of San Francisco, and Mr. E. F. Murphy, of Modesto, Cal. Mr. Colquhoun joined the Association at its sixth convention, and was President during the years 1909-10. Mr. Murphy joined the Association at its eighteenth convention. Both were respected by all with whom they came in contact, and we will miss them at our annual meetings. Suitable resolutions will be drafted by our Memorial Committee and placed upon the records.

In conclusion I extend thanks to all those who have contributed their time and efforts toward making this meeting a success. The work of Mr. Henry E. Bostwick, as Secretary, is especially commendable. He has devoted many hours of labor to the affairs of the Association, and we should show our appreciation of the work done by him and his associates by making this convention the most memorable and profitable in the history of the Association. Our twenty-second annual meeting is now in your hands. I thank you for your courteous attention.

Recent Developments In Incandescent Gas Lighting.

[Prepared by ROBERT FFRENCH PIERCE, for eighth annual convention Illuminating Engineering Society.]

Under the head of improvements come developments bearing upon:

I.—Initial efficiency of light production.

II.—Deterioration from initial efficiency and light output, either

(*a*) inherent or

(*b*) resulting from the factors usually embraced (more or less intelligently, under the head of 'practical operating conditions.

III.—Maintenance.

(*a*) Time.

(*b*) Labor.

(*c*) Convenience.

IV.—First cost per unit capacity as determining fixed charges, viz.:

(*a*) Interest on investment.

(*b*) Depreciation.

V.—Flexibility in adaptation, interchangeability of parts, etc.

In the case of incandescent gas lamps, it is highly desirable to separate the permanent and the renewal elements, since each independently influences the performance of the unit from all standpoints. The necessity of this procedure is particularly apparent in considering depreciation due to obsolescence. In the case of an electric incandescent lamp of say 250 watts, the permanent element is the socket, costing say 11 cents, and practically not subject to deterioration or obsolescence. In the case of an incandescent gas lamp of corresponding capacity, the cost of one type of burner, which is th

permanent element, is say $12. In the case of the electric lamp, the permanent part is practically negligible as regards the continued performance of the unit; in the case of the gas lamp it is highly important. The burner is composed of a gas orifice, air ports for the admission of primary air, a race-way and mixing chamber (the latter fitted with a gauze or a thermostat), a nozzle and a suitable housing or shell. The gas orifice determines, by its form and size, the velocity and air-entraining power of the incoming jet. It, therefore, influences initial efficiency and, if subjected to fouling, subsequent depreciation. The race-way mixing chamber and nozzle are the most important factors in the design of incandescent gas lamps. Their relative dimensions and form control initial efficiency, and the gauze or thermostat, if subjected to fouling, may be responsible for a considerable depreciation.

The glass cylinder or chimney which is the only accessory necessary to the performance of the present type of lamp is also of much importance; its size, form, design, number and dimension of air-holes, etc., have a considerable influence on initial efficiency, while deposits of dust or combusion products may produce considerable deterioration under service conditions.

A test to determine and separate the deterioration due to the above factors, reported by the writer, showed that under the conditions of test the burner proper was responsible for a deterioration of say 2½ per cent. per 1,000 hours, and the cylinder, say 10 per cent. The conditions of test were as nearly as possible those of actual service in which ordinarily clean gas of commercial quality is furnished at constant pressure. The air was very highly charged with particles of mineral matter, and the fouling of the orifice was undoubtedly much greater than would occur under any but the most extreme and unusual cases in actual practice. There were no gauzes in the mixing chambers, but a somewhat similar device known as a "distributor" having a similar effect was used. This device consists of a band of deeply corrugated metal bent into circular form, the axis of corrugation being parallel to the axis of the chamber. In one case the advent of a plague of mosquitoes resulted in the fouling of the distributors by their charred bodies, and produced a reduction in candle power of about 20 per cent. This simply indicated the desirability of using air-port screens—a commercial device fitted to the lamps when ordered—and obviously bore no relation to the ordinary performance of the lamps. There were a few cases of carbonization, the candle power depreciation amounting to from 20 to 25 per cent. It must be borne in mind that no adjustments were made upon those lamps for the period of test. and in this respect the conditions were more severe than those of actual service.

Carbonization is usually an indication of excessive fouling of orifice or mixing chamber, or of the inability of the gas to entrain sufficient primary air to produce a non-luminous flame. Carbon trouble from the latter source is usually confined to inverted lamps—those in which the entraining jet is directed downward—and may be corrected by adjustment. The upright gas lamp will operate without adjustment over a much wider range in gas conditions than the inverted because of the better entrainment, which provides a higher margin of primary air above the carbonizing point. From whatever cause carbonization may arise, its frequency and extent is greatly reduced by increasing the entraining power of the gas jet at the orifice.

The tests mentioned above indicated that the deterioration in light output of an artificial silk mantle is in the neighborhood of 2½ per cent. per 1,000 hours, and among the twelve mantles used in the test no failure or breakage occurred during the entire period of 5,000 hours. The inverted mantle, by reason of the manner of support, is far more rugged and durable than the upright type. There has been, and is being expended, a great deal of money upon research work in connection with gas-lighting appliances. Heretofore, work of this character has been largely confined to the mantle. The reason for this is obvious: The initial difficulties were so apparently overwhelming as to bring an early realization of the fact that technical talent of a high order, and research and investigation most painstaking and extensive, were absolutely essential to the development of incandescent gas lighting beyond the status of an interesting laboratory experiment. In fact, in the development of no other lighting appliance have the obstacles encountered and overcome been so formidable and refractory as those met in the development of incandescent gas lighting. From this standpoint it is by far the greatest achievement in illumination, ancient or modern. On the other hand, the burner was of such apparent simplicity as to be scarcely worthy of attention. Recently, however, a reversal of position is seen to be necessary. The substances available for use in the mantle, and the manipulation necessary to insure the highest quality of product, appear to have been so thoroughly explored and investigated that the direction of future developments in efficiency, permanence and mechanical strength is not even indicated.

Until the last two years little was known of the behavior of gas and air mixtures in the bunsen burner. No empirical formulæ for burner design existed, and the development of a new burner was a cut-and-dried process, the best combination being selected without any knowledge as to whether a better one might be possible. Occasionally an exceptionally efficient burner was developed, but the reasons for its efficiency were so little understood that it was often impossible to even approximately duplicate the performance in other sizes. The general opinion prevailed that the inverted burner was inherently superior to the upright in efficiency, while as a matter of fact quite the reverse is the case, and the apparent superiority of the inverted burner is due to causes entirely unrelated to the burner itself. About two years ago the first serious research work on the bunsen burner as applied to gas lighting was begun. The difficulties in the way of securing positive knowledge concerning the processes carried on in the burner are numerous. Direct quantitative measurements of the principal quantities involved are extremely difficult with any of the means available at present. The forces and masses involved are indefinitely small and the results of their interactions cannot be forecasted successfully by deductive methods. In the line of investigation undertaken it was attempted to establish certain observable criteria of burner performance which might be taken as at least indicative of the effects desired.

Orifice.—The object of the orifice is to permit the outflow of gas under conditions favorable to the maximum entrainment of and most uniform admixture with the primary air. The first investigations were conducted upon the orifice alone without raceway or mixing chamber. Surrounding the gas stream by vapor of ammonium chlorid offered a simple means of observing its behavior, as it was found that the form of stream when lighted at the orifice presented the same appearance as when unlighted and defined by vapor. Tests of actual burners also indicated that this criterion was a sufficiently useful one for practical purposes, and it was adopted for the preliminary investigation of orifices. Tests of several complete burners in conjunction with observations of the lighted gas stream from the bare orifice indicated that the most desirable jet is one which when lighted presents the smoothest flame surface, and produces the least noise and the longest and narrowest pencil of flame. Unexpectedly enough the best orifice was found to be a small circular hole in a very thin check, although deductive reasoning would indicate that since entraining power varies as the square of velocity, it should vary as the square of the efflux co-efficient of the orifice. It was found, however, that this form was suitable for only very small orifices. In larger orifices the annular form appeared most effective up to certain limits, beyond which a plurality of small orifices was required.

Race-way and Mixing-chamber.—Having determined the most suitable form of orifice, the race-way and mixing-chamber were investigated. This investigation was necessarily of an empirical nature. Preliminary investigations were based upon the size and color of the flame cone at the nozzle, this being an accurate indication of flame temperature. Although it has been known for a long time that the dimensions and forms of these parts greatly influenced the performance of the burner, the tremendous influence of apparently insignificant modifications was most surprising. It is not feasible to enter at this time into an extended discussion of the essential features of burner design as developed by these investigations. The experiments have, however, progressed to a point where the necessity for extreme refinement in design has become apparent, and the fundamental and essential features of race-way and mixing-chamber design have been clearly indicated. These are as follows:

1. The gas jet issuing from the orifice should be discharged along the axis of a straight race-way, the diameter and length of which will depend upon the quantity of gas flowing. 2. The race-way should discharge into the mixing-chamber by a suitable taper. 3. Means should be taken to furhter the intimate mixture of air and gas by utilizing a portion of the kinetic energy of the mixture in such a manner as to promote thorough mixing. 4. The formation of eddy-currents, or the useless absorption of the kinetic energy of the gas-and-air stream is to be avoided. The first and second features are necessary for the most effective entrainment of air and the delivery of the gas and air into the mixing-chamber at maximum velocity. The third and fourth requirements present the more difficult prob-

lem, and play the large part in the final result. In the ordinary type of burner, there is more or less stratification in the air-and-gas mixture, diffusion alone being insufficient to produce more than a very imperfect mixture. The limit of air entrainment, and hence the flame temperature, is therefore fixed by the most fully aerated stratum of mixture. This appears to be responsible for the low efficiency, sensitiveness, and occasional noisiness of the ordinary type. On the other hand, if uniform mixture be effected by means which too greatly decrease the velocity with which the mixture is delivered from the nozzle, the limit of air entrainment is restricted to a comparatively low figure by the rate of flame propagation in the mixture. The problem, therefore, has been to secure thorough mixture of gas and air with the least sacrifice of kinetic energy. In fact, the principal problem of burner design may be said to be one of kinetic energy. The results so far secured are: 1. An increase in efficiency of from 50 to 100 per cent. depending upon the size of the unit. 2. The entire elimination of the necessity for enclosing glassware. 3. A burner which is practically non-carbonizing and noiseless under most extreme conditions, and in which the effects of fouling are negligible. 4. Very inexpensive construction of such flexibility that practically no limit is placed upon the design of fixture, and the capacity of units may be easily altered by the changing of simple and inexpensive parts.

The revolutionary nature of this development is clearly apparent. The most serious disadvantages under which the incandescent gas lamp has labored have been: 1. Excessive deterioration in light output, due largely to the narrow range in gas conditions over which a given adjustment could operate; a comparatively small variation in one direction producing carbon, and in the opposite direction noise or "flashing back." Small accumulations of dirt either in the orifice or gauze produced the same effects as those changes in gas quality which were responsible for carbonization. 2. Necessity for frequent attention, due to the above cause. 3 Fouling of enclosing glassware. 4. Excessive initial cost of permanent parts. 5. Lack of inter-changeability of parts of different units, and lack of adaptability to the requirements of fixture design.

The elimination of practically every factor entering into deterioration in light output and efficiency leads us to believe that the laboratory performance will be approximated in actual practice and throughout the life of the mantle.

The following table gives some of the more important comparisons between the old type of burner and the new:

Operating Costs per 1,000,000 *Lumen Hours.*

Units of 200 M. H. CP. (Approximate.)

		Old Type 200 lm. per cu. ft. Cons. 4 cu. ft per hr. per Mantle Price, Mantle, 3½c. each; Burner, $12 per 200 cp. Capacity.	New Type 363 lm. per cu ft. Cons. 2.5 cu. ft. per hr. per Mantle; Price, Mantle 20c. each; Burner, $2 per 200 cp. Capacity.	Saving New Type over Old. Per Cent.
Gas in cubic feet		5,000	2,750	65
Mantles based upon 1,000 hours life		$0.44	$0.22	50
	Hours Yearly.			
Burner depreciation at 25 per cent. yearly	500	2.50	.36	....
	1,000	1.25	.18	....
	2,000	.63	.09	....
	3,000	.42	.06	....
	4,000	.31	.045	80.6
Cost of pilot lights; cons. 1 cu. ft. per hr. eac h burning continuously; gas at $1 per M. cu. ft.	500	.72	.64	....
	1.000	.36	.32	....
	2,000	.18	.16	....
	3,000	.12	.11	....
	4,000	.09	.08	11

The net saving per 1,000,000 lumen hours of the new type over the old in burning 1,000 hours per year with gas at $1 per M. is thus:

	Old.	New.
Gas	5.00	2.75
Depreciation	1.25	0.18
Renewals	0.44	0.22
Pilots	0.36	0.32
	7.05	3.47
Saving	....	.... 50.8 per cent.

It is quite unfortunate from a commercial standpoint that the new type of lamp, which cuts operating costs in half, cannot be given a distinctive name based upon some new principle or material involved in its production, in view of the fact that it parallels in the gas lighting field the position of nitrogon filled tungsten lamp in the electric lighting field, except that the former is available throughout the entire range of commercial sizes.

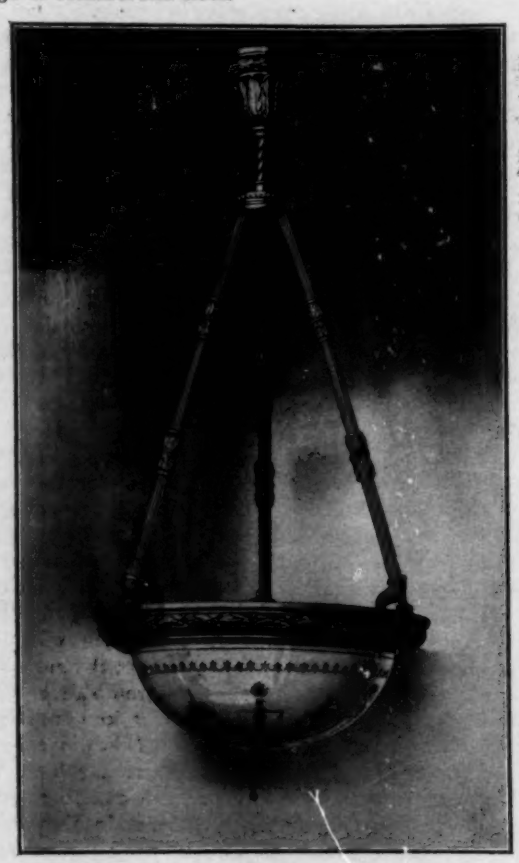

Fig. 1.—Recently Designed Gas Lighting Fixture.

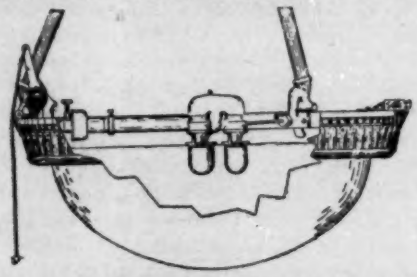

Fig. 2.—Showing Portion of Bowl Removed.

The saving in energy and material cost is, however, by no means the most important advantage of the new type. Dispensing with the chimney eliminates a deterioration in light output of at least 10 per cent. per 1,000 hours, as well as the expense due to chimney breakage. The wider range of operation without readjustment and the use of a gauze of such wide mesh that no reasonable amount of fouling can affect the efficiency of the unit makes a great reduction in maintenance labor—the greatest handicap upon gas lighting. The previous type of burner required attention at comparatively frequent intervals in order to maintain a satisfactory high efficiency. The extent to which this maintenance labor will be reduced in the new type will develop from the results of actual practice. It seems reasonable to believe, however, that the reduction should be at least 75 per cent., and probably greater. The extreme simplicity of the new type and its inexpensive construction extend its probable usefulness to a degree that can hardly be conjectured. The fixture shown herewith illustrates effects in fixture design heretofore practically impossible in connection with gas. The elimination of the bulky, unsightly and expensive burner housing makes it possible to obtain practically any effect in fixture design required with a unit of 60 to 1,200-candle power and upward in size. It is a simple matter to diffuse the products of combustion so that discoloration of the fixture is avoided and ceiling discoloration greatly reduced, or for a given ceiling discoloration the permissible minimum distance between lamp and ceiling is considerably decreased. This is accomplished by mica baffles, which, on account of the construction adopted may be completely concealed from sight. It is believed that this new type of burner practically eliminates all substantial objections to gas lighting (with the exception of those inherent in the pilot method of ignition) and will enable the engineer and architect to plan lighting systems practically without reference to the illuminants to be used.

What are the Possibilities of an American Coal Tar Industry?

Dr. B. C. Hesse, chemical engineer, New York city, comments on the coal tar industry in "Metallurgical and Chemical Engineering" as follows:

In the coal tar industry the following three divisions may be made for convenience and clariety:

I. Products from coal tar by distillation, expression and like operations.

II. Products obtained from I by chemical transformation but not themselves dyes.

III. Dyes made from II.

I and II make up practically all of paragraph 536 of the United States Tariff of 1909.

According to what purport to be official German figures, Germany's foreign trade in 1913, in these classes was as follows (in metric tons):

	Imports into Germany.	Exports from Germany.	Excess of Exports Over Imports.
I	67,501	342,893	275,392
II	673	16,311	15,638
III.....	3,238	163,874	160,636

Obviously division I. need not be further considered. As to division II, the German figures are given in three subdivisions:

(a) Analine oil and Salt.
(b) Naphthol and naphthylamin.
(c) Anthraquinone, nitro-benzol, toluidin, resorcin, phthalic acid and other coal tar products.

For division III. the figures are given in four subdivisions:

(d) Analine dyes.
(e) Anthracene dyes, other than Alizarin red.
(f) Alizarin red.
(g) Indigo.

At present the United States produces about 30 per cent. of its requirements of analine dyes (division III.), but almost entirely from materials of division II. brought from Germany.

The key to the situation lies in division II. and in this Germany controls the world's markets. This control is due to the facts that while the growth of this division was relatively slow, yet the field has become very much interwoven, each of its hundred or more products are dependent upon or made up of one or more other products, no one of them is of use without still others; the industrial and commercial conditions or relations have grown with the technical development so that the coal tar dye industry is really a conglomerate of many separate parts acting and reacting upon each other, commercially and industrially. Not a single one of the 22 factories in Germany is wholly independent of other factories in Germany, whereas together they are independent of sources outside of Germany, or can very readily be so should occasion arise. It would not do merely to transplant even the largest German works to this country; a part of probably each German works would be necessary to produce here or anywhere a complete and self-contained industry. Such a transplanting of the coal tar dye industry would be comparable to an attempt to transplant to this country every single branch of, say, the textile industry or any other highly ramified and diversified art.

Germany's supremacy in this field has been for more than 30 years a standing challange not only to the chemists and capitalists of the United States, but to the chemists and capitalists of all the world as well. Except Switzerland, no country has succeeded in selling Germany more coal tar dyes than it buys from Germany, but all of them without exception buy more of intermediate products, i. e., division II, from Germany than they sell Germany.

The seven European countries other than Germany noted for their chemists and having a large and flourishing chemical industry are Austria, Belgium, France, Great Britian, Italy, Russia and Switzerland. Their indebtedness in metric tons to Germany, together with that of the United States, for 1913, the countries being arranged in the order of their total indebtedness which is distributed over the seven items follows.

According to the latest information available the number of coal tar dyestuff works in the world and their geographical distribution n 11 countries is as follows, in the order of their number of factories: Germany, 22; France, 11; Great Britain, 11; United States 9; Austria-Hungary, 4; Switzerland, 4; Holland 2; Russia, 2; Belgium, 1; Greece, 1; Italy, 1.

	Division II			Division III.				
	a. Anilin Oil.	b. Naphthol and Naphthylamin.	c. Anthro Quinone, etc.	d. Anilin Dyes.	e. Varicolored Alizarins.	f. Alizarin Red.	g. Indigo.	Net Totals.
1. United States..	2,438	638	965	13,855	2,164	493	3,471	24,004
2. Great Britain..	340	333	°34	10,793	1,130	1,493	1,180	15,235
3. Austria.....	655	109	284	5,582	*223	207	1,361	7,975
4. Italy.....	650	....	825	4,097	158	...	662	6,392
5. Russia..... ...	602	1,117	998	1,098	156	174	434	4,579
6. Belgium.....	120	....	108	2,500	96		313	3,037
7. France.....	.	217	776	1,301	134	98	323	2,839
8, Switzerland....	1,217	272	1.201	*941	....	259	....	2,008
Net Totals.....	6,012	2,686	5,123	38,185	3,605	2,724	7,734	66,069
Number of countries Germany exported to.....	11	6	11	32	12	9	21	

Summarized by divisions II. and III. the results are:

	II.	III.
United States.....	4,031	19.973
Great Britain.....	639	14,595
Austria.....	1,048	6,927
Italy	1,475	4,917
Russia.....	2,717	1,862
Belgium.....	228	2,809
France.....	993	1,846
Switzerland.....	2,690	*682

* Credit.

In the course of the development of this business 16 plants that made coal tar dyes have abandoned that work, 11 in Germany and 1 each in Austria, Belgium, France, Great Britain and Switzerland. Fourteen have been absorbed by others, 6 in Germany, 4 in Switzerland, 2 in France and 1 each in Belgium and Holland.

Where these 7 countries together have failed so signally it cannot be fairly urged as a fault of the chemists of this couutry that they have not succeeded.

There is another side to this, namely, the investor's side. A self-contained and complete coal tar dye industry in this country would to-day call for preparedness to make about 700 different dyes. In the fiscal year 1913-1914 this country imported indigo to the extent of $1,093,226, alizarin to the extent of $845,459, both of which are without tariff protection; $7,464,134 worth of aniline dyes, with a duty of 30 per cent. and aniline oil, with a duty of 10 per cent. This means 700 different analine dyes would average a gross annual income each of about $10,000. To introduce 700 differant sets of operations and perhaps half that many different sets of apparatus at one time to produce on the average for each set of operations a gross of $35 per day can hardly be regarded as an attractive proposition when the initial lump gross outlay would be not less than $5,000,000 actual cash. Each of these 700 products requires good manufacture from the start because good qualities of each are already upon the market. It is one thing to grow and develop such an industry or art and to maintain it against newcomers, but it is quite a different thing to build it up afresh and in its entirety in the face of competition and to hold it against those who developed the business, know all its ins and and outs, have their experience and plant bought, paid for and written off long ago. It could hardly be expected that if successful this would employ as many as 7,000 people all told and the gross makes out less than 0.4 per cent. of our total import business.

With unlimited and immediately available capital the American chemist can build up such a complete industry, but the dividends would be a long way off. Capitalists, American or otherwise, do not take kindly to such handicaps or obstacles, and justly so.

The truth seems to be that the whole of this industry cannot be successfully transplanted and attempts to transplant part only have not resulted in any self-contained and independent industry anywhere but in a thing whose real roots are still in German soil, and if it could be transplanted as a whole the net result would not be commensurate with the expense, effort and risk connected with it. What portion or part if any, and the equivalent of a complete and self-contained industry for all the domestic needs of this country

could ultimately be transplanted here is a problem that has had the serious attention of competent chemists and capitalists in this country for many years without a definite or satisfactory answer thereto having been arrived at. If the present conditions will contribute to a solution thereof cannot be decided out of hand, the first impression certainly is that they will not so contribute.

Artificial Illumination and Its Effects on Vision.

[By F. K. Richtmyer, in *Electric World.*]

The deleterious effects of artificial illumination upon the eyes has long been recognized. At least as early as 1847 experiments were made to study the effect of radiation on eye media. Since that time the ever-increasing annual output of papers on the subject seems to point to a recognition of the fact that coincident with the increase in efficiency and intensity of modern artificial light sources has come an increasing amount of eye strain and kindred maladies, some of them vague and indefinite, but none the less serious, for they seem to indicate a pathological condition little, if at all, understood.

Perhaps the most natural place in which to seek an explanation of this baffling defect in our artificial illumination is in some property or peculiarity of the illumination itself. But experiments performed with systems of illumination which imitate daylight in every way possible, except as to intensity and spectral energy distribution, seem to result in the same eye strain. Quite recently Luckiesh and others have raised the question that eye strain may, in some manner, be caused by the relatively large proportion of infra-red contained in the spectrum of our artificial sources. Assuming that the coefficients of absorption of eye media are similar to those of water (for the longer waves at least; they are known to be different for ultra-violet), Luckiesh computes that a large part of the energy from artificial sources is absorbed by the cornea, although no inconsiderable part reaches the retina. This same conclusion has been reached, qualitatively at least, by Vogt, who showed experimentally that the infra-red energy reaching the retina from artificial sources is many times that represented by the rays within the visible spectrum.

Promising as this suggestion may seem, there are three serious obstacles in its way. (1) It is difficult to correlate it with the fact that, in at least the large majority of cases, it is the ultra-violet and the shorter visible rays which are photo-chemically and photo physiologically active, and we should not therefore expect the infra-red to cause changes of this character. (2) The simple absorption of heat from the light of artificial sources can hardly be, of itself, the cause of our defects in vision, since, on account of the much greater intensities encountered in daylight conditions, the total amount of heat produced in the eye media is of at least the same order of magnitude for the two kinds of illumination. (3) Neglecting errors of refraction, much of our eye trouble seems to be due to pathological disturbances of the retina, which, in the normal eye, receives per lumen only three or four times as much energy flow from artificial as from daylight illumination. To be more specific, if we accept the data given by Luckiesh for the absorption of energy in the various eye media, we can easily compute how much of the incident energy (power) per lumen reaches the retina from the several sources considered. These data are shown in the accompanying table.

Table Showing Energy-flow and Watt-per-Lumen Relations.

Source.	Watts per Lumen.	Percentage absorbed by Eye Media.	Percentage to Retina.	Watts per Lumen on Retina.*
4-watts-per-cp carbon lamp.....	0.385	87.9	12.1	0.047
1.25-watts-per-cp tungsten.....	0.126	80.0	20.0	0.025
Black body at 2,000° C.....	0.223	89.7	10.3	0.023
" " 2,500° C.....	0.0795	76.7	23.3	0.0185
" " 3,000° C.....	0.0310	65.1	34.9	0.0108
" " 4,000° C.....	0.0155	45.9	54.1	0.0084
" " 5,000° C.....	0.0115	30.5	69.5	0.0080

*The term "watts per lumen on the retina," as well as the corresponding term "watts per lumen absorbed by (the several eye media)," in the article referred to by Luckiesh, is really a misnomer if taken literally. It is really an abbreviation for the longer statement, "watts per lumen available as visual energy," only a small part of which reaches any one retina to be transformed in part into visual sensation. In other words, this column gives in arbitrary units the flow of energy per lumen reaching the retina, assuming (what we probably have no right to assume) that pupil opening is not affected by the spectral energy distribution of the source concerned.

From the last column of the table it is seen that the ratio of the energy received on the retina from a 4-watt-per-candle-power carbon lamp is only about six times (0.047 ÷ 0.008) that received from a black body at 5,000° C., and for a tungsten lamp only about three times. Taking into account the much greater intensities of daylight, it is seen that the difference in the amount of energy received on the retina is not so great as might at first thought be expected. Apparently heat production cannot be held accountable for retinal disturbances.

And yet the suggestion that eye trouble may be caused by the more refrangible waves of artificial sources seems to meet with the very obvious objection that our artificial sources are far weaker in ultra-violet, both in relative and in absolute measure, than is daylight, under which we can work with a maximum of comfort and efficiency, and which causes little or no eye strain.

But it is logical to expect that the difference in efficiency of our visual apparatus with daylight and with artificial sources must be due to some physical difference in the two illuminations produced thereby? Should we not also look to some difference in the receptive condition of the eye? When we find any deleterious effect on the human organism due to the peculiar exactions of civilization we are usually reminded that the *summum bonum* of existence will be obtained only by a "back to nature" movement. Accordingly we are not justified in raising the question: In what way do modern systems of illumination require our eyes to meet conditions to which primitive man was unaccustomed during the long period of evolution?

Duality of Structure and Function.—The dual physiological structure of the retina—that is, the rods and the cones—coupled with experimental evidence of a very positive character, has led us to believe in a dual functioning of the eye; that the cones are used for daylight vision and the rods for the socalled twilight vision. This duplicity of structure and function seems perfectly in accord with modern conceptions of evolutionary development. During the countless ages when our visual apparatus was being developed two radically different intensities of illumination were encountered: (1) the exceedingly high illuminations of midday, and (2) the very low illuminations at night. It seems reasonable, therefore, to suspect that two sets of visual apparatus should have been developed to meet the two radically different intensities. Note that before the day of artificial illumination there was practically nothing between these two extremes. In this respect then, at least, we are imposing on the eye conditions which were not met during its evolution and for which, therefore, nature has made no provision, for the intensities customarily met in artificially illuminated rooms are midway between those of daylight and night time.

But the question might well be raised: What evidence of a physiological nature is there to expect that this moderate illumination, to which primitive man was unaccustomed, would produce harmful effects on the eye? As a possible answer to this question we will consider several bits of evidence which, while not at all conclusive, are at least suggestive.

C. Behr reports clinical observations on four persons who were afflicted with disturbances of vision due to working under artificial illumination. Aside from errors of refraction, these patients complained of disturbances evidently connected in some way with the functioning of the retina, such as flickering, inability to see their work after looking for a short time toward the darker parts of the room, a diffuse gray sensation when coming into daylight from artificial light, and other symptoms of an indefinite nature. A determination of the adaptibility-time curve for these patients showed that they possessed a sensibility far below normal. Thus, if we call the sensibility of the normal eye 10,000 (the reciprocal of the minimum observable illumination) after a 45-minute exposure to darkness, the sensibility of these four patients was, in round numbers, 1,000 for the same duration of adaptation. At least one of the patients regained normal sensibility when he returned to daylight work. Experiments by Behr on patients from whom the lens had been removed showed that this same depression of the adaptation curve could be produced by short exposures to ultra-violet radiation greater than 330. To appreciate the full meaning of this observation we must understand the physiological process by which adaptation is accomplished, as well as the process by which radiant energy is changed into visual sensation.

Unfortunately neither of these processes is at all clear to us. About the latter we know practically nothing. Regarding the former a reasonably good working hypothesis is based upon the "migration" of the dark pigment which is found closely associated with the rods and cones of the eyes of nearly all animals. Direct observation on

microscopic sections of the excised eyes from recently killed frogs has shown that when the animal is kept in the dark this pigment crowds in around the base of the rods and cones, leaving the entire surface of these nerve ends free to receive light energy. When, however, the animal is kept in the light it is found that this pigment has pushed forward and has covered all but the tip ends of rods and cones, thus reducing the surface area upon which light may fall and consequently decreasing the sensibility. Although direct experiments on mammals have failed to show the migration of this pigment, observations by Klein can be explained, readily at least, on no other hypothesis. The the theory is at least a workable one, therefore, that in ordinary daylight vision only the tips of the rods and cones are exposed to radiation, while in twilight vision (that is with the eye dark-adapted) the whole surface of the rods and cones is exposed.

We may, therefore, conclude that the rods and cones of primitive man were accustomed to work under only two conditions: (1) with the tip ends of the nerves receiving a high illumination and (2) with the whole surface of the rods (and cones) receiving a very low (night-time) illumination, excepting perhaps for a brief period after sunset and before sunrise.

Now, it is well known that the eye, as used in artificial illuminations, is partially dark-adapted. That is, the pigment has partially receded, leaving a part of the upper portions of rod and cone surface exposed to an intensity to which, in primitive man and animals, it was not accustomed. Ought we not, therefore, to expect on this surface an effect—we can hardly call it a burn—somewhat like the sunburn produced on the city dweller when he goes camping? The guide, accustomed to out-door conditions all his life, experiences no ill effects.

Of course, the skin readily recovers from sunburn and soon be comes immune. Why should not these upper parts of the rods and cones soon become immune to the effects of light relatively too intense? We can only suggest an answer: the skin, from its unprotected position on the outside of the body, must have been developed to meet rapidly changing conditions, and therefore readily adapts itself to new environments; whereas, until very recently, from the standpoint of evolution, the sensitive parts of the retina have never been compelled to work under any but night-time illuminations After a few dozen centuries of artificial illumination possibly our eyes will become immunized!

What this ill effect may be, or by what radiations it may be caused, it is of course idle to speculate. On the present theory, we should expect it to interfere with the mechanism of (retinal) accommodation by making a part of the rod and cone surface less sensitive to light, or, rather, less efficient in transforming radiant energy into visual sensation. This was indeed what Behr found. Furthermore, small as the quantity of ultra-violet energy in artificial sources is, to say nothing of the still smaller proportion which ultimately reaches the retina, it may yet be sufficient to cause a disturbance on such a very sensitive surface as the rod and cone surface must be, especially when we consider that photo-chemical effects are not necessarily dependent on the energy of the radiation which causes them. But it does not seem necessary to hold the ultra-violet alone responsible. It may be that energy of any wave length, of an intensity so many times that for which it was intended, falling on the exposed rod and cone surface of the partially dark-adapted retina would cause deleterious effects.

In this connection it is to be noted that many persons subject to eye strain and kindred dirturbances of a seeming retinal origin work with perfect comfort in daylight. This would be expected. When the eye is light-adapted to the intensities usually met in daylight, the injured surface of the rods and cones is covered up and only the tip ends are functioning. These same people are fairly comfortable under a very weak artificial illumination—which again agrees with the theory here put forth.

Individual Preferences in Light Sources.—There are those who, for the sake of comfort, prefer the carbon lamp to the tungsten; and even the old open flame gas burner, with its still smaller proportion of blue, violet and ultra-violet, to the carbon. One case which has recently come to the writer's attention was that of a person who had been accustomed to work at a desk lighted by a 16-candle power carbon lamp. The carbon lamp was replaced by a 25-watt tungsten, and immediately eye strain began to be felt. After a time the carbon lamp was replaced and the eye strain at once ceased. It may be that the physiological reason back of this peculiar preference for "yellow" light—a preference which those of us who are scientifically inclined stigmatize by calling a "notion"—is based on some such effect as has here been suggested, namely, that the larger proportion of violet and ultra-violet in the whiter sources acts in a more harmful—or at least unpleasant—manner on those parts of the rod and cone surface accustomed only to night-time conditions, even though the intensities of illuminatlon, photometrically measured, produced by the several artificial sources may be equal.

The above suggestions are recorded simply as possibilities to be established or—more likely—cast aside by future experimental work. Certain it is that, after much investigation in this field an explanation of the peculiar phenomena observed appears to be as far away as ever, and those who are working along these lines seem to welcome suggestions from any source which may serve to aid their efforts.

Constructing the High Pressure Gas Line to Louisville, Ky.

[From a paper by LEWIS S. STRENG, read before the Engineers and Architect's Club, Louisville, Ky.]

The construction of a 12-inch steel pipe line for carrying natural gas from Inez, Ky., to Louisville—a distance of 180 miles—presented many difficulties. The work was commenced Aug. 8, 1913, and completed and tested on March 12, 1914. The unusual difficulties of the undertaking were due largely to the nature of the country. The work on the Louisville end was simple compared to that in the mountains. Delivery of material was a problem. In some places, the nearest railway was 40 miles distant, and the wagon roads hardly deserved the name. A team would start from Paintsville with two lengths of pipe, the load amounting to less than a ton, and return light, taking 3 days for the round trip. After 150 teams had made several trips, the roads were in miserable condition, requiring a repair gang to keep them passable. On the Louisville section, much foreign labor was employed, but not back in the hills. The mountaineers drove the foreigners out of the country. The mountaineers were splendid workmen. They would walk 4 or 5 miles before daybreak, do a day's work and go back home with a lantern.

The steel pipe used was 12 inches inside diameter, ¼-inch thick, weighed 45 pounds per foot, and averaged 20 feet to the length. Each joint was tested at the mill at 1,000 pounds pressure and carefully inspected for defects. The couplings used were steel forgings of the familiar Dresser type, consisting of a central ring, two rubber-compound gaskets and two followers drawn up by steel bolts. Screw pipes were used in all river and creek crossings, with leak collars with rubber gaskets placed over the screw couplings, and over all this was bolted a heavy split iron sleeve, or river clamp. Under all rivers, two lines were laid with valves and Y's at either end.

At railroad crossings, the pipe was placed in a 20-inch cast iron casing fitted with valves on either side of the right-of-way. Eventually, a second line will be laid, with provisions for cutting out any section desired. In case of trouble, the check valve will prevent the escape of gas from the Louisville end.

The line was tested as laid before any of the couplings were backfilled. For testing purposes, two temporary compressor stations were erected, one on the Kentucky river, about 7 miles above Frankfort, and the other on Mud Lick in Johnson County. The line was pumped up to 350 pounds per square inch, and then carefully inspected for leaks. The excellent results obtained by this method were shown by a 48-hour acceptance test of the whole line last February. At 350 pound pressure, the leakage in 24 hours was less than ¼ per cent.

The construction force was organized in two divisions, one for the mountains and one for the Blue Grass, each in charge of a general superintendent. The headquarters of the mountain division was at Paintsville, with a territory to be covered of about 65 miles. The other division was about 115 miles long, with headquarters at Lexington. Each division had two large gangs, with full camp equipment. These gangs started at the compressor stations and worked toward the ends of the divisions. In addition, each division had a special gang which installed the river, creek and railroad crossings. After more than half the work was finished, another gang was organized to hasten the completion of the work. The number of men in each gang varied from 200 to 500.

During the preceding summer, a survey had been made, and most of the right-of-way obtained. Stakes were set every 200 feet. and the first job of the construction gangs was to clear the right-of-way from

(*Continued on page* 202.)

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NEW YORK, MONDAY, SEPTEMBER 28, 1914.

[Official Notice.]

Transportation Arrangements, American Gas Institute Meeting.

Chicago, Ills., Sept. 22d, 1914.

The Committee on Transportation for the New York Meeting of the American Gas Institute consists of the following gentlemen:

J. W. Batten, Detroit City Gas Company, Detroit, Mich.
N. W. Gifford, East Boston Gas Company, Boston, Mass.
Joseph F. Guffey, Philadelphia Company, Pittsburgh, Pa.
John B. Klumpp, The U. G. I. Company, Philadelphia, Pa.
Donald MacArthur, Laclede Gas Light Company, St. Louis, Mo.
John E. Morehead, Peoples Gas Light and Coke Company, Chicago, Ills.
W. Cullen Morris, Consolidated Gas Company, New York, N. Y.
J. E. Stacey, Stacey Manufacturing Company, Cincinnati, O.
B. J, Kellum, Chicago, Ills., Chairman.

The arrangement contemplated is a special train from Pittsburgh to New York, made up of special cars from Detroit, St. Louis, Chicago and Cincinnati; which will be in charge of Messrs. Batten, MacArthur, Morehead and Stacey, respectively. Mr. Guffey will handle the reservations out of Pittsburg and Mr. Klumpp will handle those out of Philadelphia.

No special arrangements will be made for the New England delegates, as it is presumed their close proximity to New York make this unnecessary. An official announcement, giving full particulars of the leaving and arriving time of the various specials, railroad fares and Pullman rates, with return postal card for reservations, will be sent well in advance of the meeting to all members located in the territory tributary to the points from which the special cars will run, and to facilitate the work of the railroads it is requested that those desiring accommodations on these specials will fill the card out promptly, and mail it to the member of the Committee having charge of the special upon which reservation is requested.

B. J. Kellum,
Chairman Sub-Committee on Transportation.

[Special Editorial Correspondence.]

SEVENTH ANNUAL MEETING, CANADIAN GAS ASSOCIATION.

Ottawa, Ontario, September 18, 1914.

The second day's session of the Association opened with the report of Nominating Committee, and the following officers were elected:

President—H. E. Mann, Chief Engineer, Montreal Light, Heat and Power Company.

First Vice-President—R. A. Wallace, Manager Quebec Railway, Light, Heat and Power Company.

Second Vice-President—J. M. H. Young, London.

Secretary and Treasurer—John Keillor, Hamilton.

The Executive Committee selected was Arthur Hewitt, Toronto; J. S. Norris, Montreal; Samuel Carter, Guelph; J. P. King, Stratford, and A. A. Dion, Ottawa.

Mr. H. E. G. Watson, Superintendent of the Industrial Department, Consumers Gas Company, Toronto, read a lengthy paper on "Gas Fired Steam Boilers," which was highly complimented as being one of the most exhaustive treatments of this subject before any gas convention. A paper on "Commercial Lighting" was given by W. Kennedy, Superintendent New Business Department, Consumers Gas Company, Toronto. The short topics brought up for discussion were: "The Standardization of Gas Meter Connections," "Prepayment Meter Thefts and How to Avoid Them," and the question of the steps that should be taken to extend the membership of the Association, and the proposed new government regulations and calorific standard. The interest in the last topic was added to by the presence of the Deputy Minister of Inland Revenue for Canada, which department is considering a change in conformity with British practice. Mr. Lamb, an official of the Inland Revenue Department, gave a decidedly novel address, explaining the department's instruments for testing gas, etc., throughout the Dominion.

After the selection of Montreal as the meeting place for 1915, the convention came to a close; the delegates being asked to drive through the public parks and streets of Ottawa, ending with an inspection of the new gas works of the Ottawa Gas Company, where a complete new vertical system has been installed.

Altogether this has been a very successful meeting, but the Canadian Association never fails to justify its existance, and well repays those who travel to its meetings.—A. G. N.

[Special Correspondence by Telegraph.]

EIGHTH ANNUAL CONVENTION, ILLUMINATING ENGINEERING SOCIETY.

Hollenden Hotel, Cleveland, O., Sept. 21, 1914.

The registration this morning before the meeting convened had reached 150 with more arrivals by every train. The convention was called to order by Mr. W. M. Skiff, Chairman of the General Committee. Mayor Newton D. Baker welcomed the members to Cleveland, and the address in response was by Prof. G. A. Hoadley. President Bond now took the Chair and delivered the annual address. He made a strong plea for more clearly defined lighting standards and nomenclature; and advocated teaching in our common schools the fundamental principles of correct lighting.

Report of the Committee on Progress gave all the year's development in illumination and in the lighting field, and was replete with valuable information. It represents a vast quantity of work and is a credit to Committee.

The afternoon session was devoted to the papers on "Colors of Illuminants," by L. A. Jones; "Artificial Daylight—It's Production and Use," by M. Lukiesh and F. E. Cady; and "Development of Daylight Glass," by E. J. Brady. Their discussion was participated in by Messrs. Ward, Lukiesh, Roe, Gage, Stickney, Pierce, Jones, Lloyd and Ives.

The reception and ball this evening was attended by more than 200 ladies and gentlemen and was greatly enjoyed.—L. M. H.

September 22, 1914.

This morning's session took up the papers on "Relation of Light to the Critical Inspection of Documents," "Planning for Daylight and Sunlight in Buildings," and "Air-shaft Illumination Studied by Models." The afternoon was devoted to visiting some of Cleveland's noted manufacturing establishments, and this evening we had the lectures by Prof. J. H. Smith and Mr. M. C. Rapinski, both of which were interesting and well attended. The registration has increased largely.—L. M. H.

September 23, 1914.

To-day attention was divided between the Commercial Session and the Laboratory division, in both of which the program was followed, the papers being particularly good. This afternoon's Commercial session opened with the paper by R. F. Pierce, on "Recent Developments in Incandescent Gas Lighting (see text on Mr. Pierce's paper, p. 194 of this issue of the Journal) giving some of the startling re-

sults obtained with the new kinetic design of inverted burner. At the end of this paper, the Chairman called on Mr. W. H. Gartley, President of the American Gas Institute and Past President of the Society. Mr. Gartley spoke briefly, but pointedly. Then came the discussion of the last paper by Messrs. Hutchinson, Barrows, Norman Macbeth and Sweet. Macbeth's talk was full of encouragement for gas lighting, and urging advanced commercial tactics to push the efficient appliances now available. To-night's banquet was a great success. Mr. Gartley was toast-master (none better than!) The speakers were L. B. Marks, the first President of the Society, who spoke on the "Early History of the Society;" President Bond, whose subject was "A Rèsumè;" Dr. McAllister on "Future Work;" and Mr. C. F. Brush on "Reminisceuces of Early Lighting." Others who spoke briefly were: J. R. Cravath, Prof. Hoadley, J. P. Israel, Norman Macbeth and Dr. Sharp.—L. M. H.

September 24, 1914.

This morning's session took up the remaining papers: "Some Uses of Light in the Treatment of Disease," "Some Experiments with the Ferree Test for Eye Fatigue," and "Further Experiments on the Efficiency of the Eye under Different Conditions of Lighting."

The afternoon was fully occupied by the trip to Nela Park, ladies accompanying us. The inspection of the offices and laboratories of the National Lamp Works was most interesting, it being a "thing of beauty" architecturally, as well as a remarkable manufacturing plant. Outdoor diversions were also provided, and at 6:30 an elaborate dinner in Nela Camp. After the dinner, two papers were read: "The Visibility of Radiation," and "Some Recent Experiments on Vision in Animals," and entertainment was provided for the ladies. Dr. A. S. McAllister, President-elect, then closed the Convention, a wonderfully well-managed function, and technically measuring up to any ever held.—L. M. H.

BRIEFLY TOLD.

PHILADELPHIA SECTION, "GAS MEETERS."—The Philadelphia Gas Meeters opened the season on September 23d with a "get together" dinner at the New Bingham Hotel. Unusual interest was taken in discussing plans for the new year, looking toward the advancement and further development of the organization. Before the meeting adjourned there was prevalent a spirit of enthusiasm which it is expected will be of great benefit to the Philadelphia Section. Numerous members pledged themselves to bring in new members by the time of the next meeting, and the earnestness with which the welfare of the Section was discussed gives to the future an agreeably rosy hue. The new Commissioners made a good start.

UTILITIES MUTUAL INSURANCE COMPANY.—The monthly bulletins of the Utilities Mutual Insurance Company, of New York, besides giving a list of accidents reported by the company members, and suggestions for prevention, is intended to give information that will be helpful in promoting humanitarianism, co-operation and high standards of safety. The present work of the company is largely in collecting statistics, and reports on the physical examination of all employees. In this connection the attention of members is called to the importance of not employing applicants who are in such physical condition as to make them either a poor risk or liable to become a permanent burden. The physical examination of present employees is also of great importance, for when an accident occurs it is sometimes impossible to tell whether a physical defect did or did not exist prior to the accident. With regard to the present employee, who through physical defect may not be a desirable risk, they only ask that no duties be assigned him which would enhance his liability to injury through the known physical deficiency existing. As an instance, a member should not employ a man who has only one arm, because if he should lose the other arm he would become totally disabled. On the other hand, if a member has a one-arm employee, he need not be dismissed, but he should not be assigned hazardous duties. Inspection of plant conditions are also being made, and recommendations for betterment are sent members on all points succeptible of improvement.

CAPITAL FOR PUBLIC UTILITIES.—"So long as a public utility corporation is growing and increasing its business it requires yearly additions of capital," says the *Wall Street Journal*, "and when it no longer requires new capital it will be found that it is going backward both in business and earnings. Public Utilities managers say that experience over a long period of years shows that for each $1 of new business secured by artificial gas companies from $2 and upwards of new capital is required; for electric light and power properties about $5 for each $1 of new business; for street railway and traction lines between $5 and $6 for each $1 of new business; and for hydro-electric powers even a higher ratio. Reports of the Gas and Electric Commissioners of Massachusetts, extending over a period of years, show that in that State the public utility corporations have averaged about $5 of new capital for each $1 of new business." The article then points out that on this showing it is manifestly impossible that the companies can make necessary extensions and improvements to meet new business demands out of earnings, but must secure new funds from outside sources, which under present financial condition is admittedly impossible.

THE BRITISH COMMERCIAL GAS ASSOCIATION TO OMIT ANNUAL CONFERENCE.—Our British brethern while handicapped in many ways by the war's demands will not allow any let-up in their advertising activity. The following letter has been sent to all members:

DEAR SIR: In view of the abnormal conditions now prevailing in this country, and likely to prevail for some considerable time, the Executive Committee have decided to recommend to the General Committee the following course of action:

(1) To proceed with the full publicity campaign during the ensuing year, so as to assist the industry as far as possible to carry on its "business as usual;" the copy used to be made specially applicable to the exceptional conditions of both industrial and domestic economies.

(2) To hold no annual conference this year; the visit to Glasgow being postponod until October, 1915.

(3) To hold, as a matter of form under the rules, an annual general meeting at Caxton Hall, Westminster, at 3 P.M. on Tuesday, the 27th October, to receive the annual report and statement of accounts.

(4) To postpone until October, 1915, the retirement of the President, Bailie Thomas Paxton, who, under the present exceptional circumstances, has consented (contrary to his personal convenience) to serve for another year.

(5) To postpone until October, 1915, the retirement from office of those members of the General Committee who would in the ordinary course have retired in October, 1914, and have then been eligible for re-election.

It if felt by the Executive that it will be impossible to obtain a representative attendance of members at the necessary annual general meeting at the present time, and that it is, therefore, desirable to allow all matters upon which members might be called upon to vote to remain as they are until a more favorable season.

These proposals will be laid before the General Committee on the 15th prox., and, if then approved, will be formally submitted for ratification to the general meeting on the 27th of October.

Unless the Secretary hears from you to the contrary before the 15th of September, the Executive will assume that their recommendations are approved.

If there are any matters concerning the development of the sales of gas and coke upon which members feel that official representations by the Association to the authorities could usefully be taken at the present juncture, will they please communicate with the Secretary.

The position in regard to the supply of mantles and glassware is receiving careful consideration. Yours faithfully,

(Signed) F. W. GOODENOUGH,
Chairman of the Executive.

NEW YORK SECTION, "GAS MEETERS."—The first of this season's New York "Meeters" dinners was on Thursday last, at the Hotel McAlpin, and brought together between 70 or 80, in the beautifully decorated private parlor and dining room on the Mezzanine floor. The speakers were the Honorable W. N. Calder, Congressman for Greater New York and candidate for United States Senator, and Mr. J. Alexander Mayers and Grand Commissioner L. R. Dutton. Four professional entertainers gave songs and dances, and the good story-tellers all contributed. Some time was devoted to the consideration of ways-and-means. Chairman Campbell explained that this evening's arrangements was a sample of a meeting on more sumptuous lines as to surroundings and cost than heretofore, and asked if the "Meeters" would like to continue such; calling attention to the fact that additional income would be necessary for it, and that the Commissioners had bought, at a price, 260 tickets for a performance at the Fulton Theatre on the night of Wednesday, Oct. 7th, the sale of which, at the regular theatre price, would net the "Meeters" $175, and put them in funds for many months. After full discussion the action of the Commissioners was endorsed, as was also the proposition to make the price of dinner tickets $2 to registered "Meeters" only. The Chairman announced the appointment of four Advisory Committees as follows: On Entertainment—Messrs. Brock, Wilson and Conroy; on Papers—Pettes, Root and Harraden; on Finance—Rogers, Ambler and Gillingham; on Membership—Hammond, Smith and Nutting; on New Business—Korthaus, Melick and Myers. At 10 o'clock the last musical number was given; and after adjournment the new Commissioners, Alexandea Sinai, J. S. MacArthur and S. K. Campbell, were highly praised for selecting such a meeting place.—B.

(*Continued from page* 199.)

16 to 20 feet wide. The digging crew then roughed out the trench, throwing the earth to one side; the other side being left clear for pipes. Where rock was encountered, a drill gang came next and the way was blasted. After them came the graders, who trimmed the trench to proper dimensions, normally 18 inches wide by 36 inches deep. Changes of grade up to perhaps 5° could be made in the couplings; but in general the straight pipe was laid at an even grade, and fire bends made where necessary. A small gang went ahead inspecting the pipes, dressing off any roughness at the ends, and making the necessary bends. The pipe was then laid on skids over the trench and the couplings fitted. After a section had been finished, the lengths varying from 100 feet to a half mile, according to topography, the gang came and lowered the pipe into the ditch. Last came the backfilling gang. On level stretches, teams with drag-scrapers were used. On the slopes, breakers were built to hold the fill and leave the couplings exposed. Following the laying of the sections in the trench and their testing out, a small gang covered the couplings and trimmed up the fill.

The task of hauling material was a serious problem, as has been indicated, but that of stringing the pipe along the right-of-way was even more difficult. At convevient locations, the pipe could be unloaded where desired, snatch teams being added as required. Frequently, however, block and tackle were used. Five or six teams were sometimes needed to move a single length. On some of the trenching, gasoline-driven drag-line ditching machines were used. In good going, they could dig 2,000 feet of 18 by 36-inch trench in a day; but they were useless on grades, or where rock was encountered. They traveled very slowly and lost much time by necessary detours.

The best day's work reported by any of the gangs was about 1 mile of ditch. Occasionally, a pipe gang would report as high as 6,000 feet of pipe laid in a single day; in the rough country, 750 feet was an average day's work. At times, when practically the whole trench was through rock, a gang of 200 men could not make more than 200 feet per day.

Gas Street Lighting.

[Prepared by C. B. Babcock, for Twenty-second Convention, Pacific Coast Gas Association.]

It is thoroughly in accord with progress and modern ideas to say that those cities which are best lighted show the greatest advancement in civilization. Surely one does not look for well-lighted municipalities in the uncivilized nations; and thus we are educated to believe that proper illumination stands for progress, and the pursuit of all the things that spell advancement. The great nations of antiquity spent considerable time and effort in the development of lighting appliances, giving some attention to street lighting; but, of course, a great deal more to the proper illumination of interiors. With the passing of time the rise and fall of nations is recorded; and always those in the forefront, those most progressive and striving hardest for supremacy, show equal energy in perfecting devices to more efficiently illuminate their streets. This is a natural course, for with greater civilization law, and order prevail. Darkness encourages crime; light discourages; the records prove that the best lighted municipalities show a minimum of violence.

With the advent of illuminating gas one hundred years ago, began the real illumination of streets. Gas paved the way for permanent street lighting and held undisputed sway for many years. In fact, most of the great cities of the world were lighted from no other source. Very crude burners were utilized, viewed in the light of modern invention, but nevertheless they were immensely superior to oil burners and candles. Finally electricity was introduced and, in many instances, usurped the place of gas for street illumination. Still gas held its own. Evolution came with the invention of the gas mantle, and from this nucleus gas has had an anchor or base of operation; and throughout the past twenty years has fought valiantly for every inch of ground, but invariably with obsolete weapons. It is a stirring tribute to illuminating gas, an epic in fact to its efficiency, that throughout all these years it has withstood the onslaughts of time and competition and still holds its own.

Shortly after electricity entered the field, many gas and electric companies combined and almost invariably the control passed to hands of electric men, who very naturally preferred and advertised electricity for street lighting rather than gas. Looking at it from a business point of view, they saw that gas could be stored; but production beyond the actual consumers' needs of electricity meant loss of current. Thus street lighting was an outlet for their surplus product; and possessing greater advertising possibilities, they realized to the fullest extent that municipal illumination impressed the citizens with the advantage and up-to-dateness of the new source of illumination. Gas was old, familiar, and therefore contemptible. To be progressive one needs must use this new light, not that it gave better illumination, but more modern. The business of manufacturing and selling gas has been passing through an evolutionary period, and now the heads of gas utilities are beginning to understand the advantage of gas lighted streets; and consumers are brought to realize the superior illuminating qualities of gas over any other source excepting daylight.

It is well to review the municipal street lighting situation as it faces the gas men to-day. In the city of New York there are 44,000 gas mantle lamps and 17,991 incandescent electric lamps; Philadelphia, Pa., has 23,719 gas mantle lamps with 14,616 electric lamps; and 19,105 gasolene lamps. In Boston, Mass., there are over 14,000 gas mantle lamps. In St. Louis, Mo., over 18,000.

It is noteworthy that Atlantic City. N. J., has authorized the gas company to install 200 three-burner inverted lamps for street lighting. This is of great interest as evidence of the progress of gas for street lighting purposes, for Atlantic City is probably one of the best known cities in the world, having attained great fame as a summer resort.

San Francisco has 7,795 gas street lamps, over 100 per cent. more gas than electric lamps. In Oakland, Cal., there are 971 gas street lamps.

The Panama-Pacific International Exposition, recognizing the high efficiency of gas for illumination, have contracted for the installation of 140 gas arc lamps for the lighting of the Zone, the street on which all the amusement concessions are to be located. It is 3,500 feet in length and there will be 70 posts equipped with two 5-burner arcs giving 1,800-candle power per post.

The main street of Portland, Ore., is lighted entirely by inverted gas arc lamps, three to the post, 66⅔ feet apart, and the approximate candle power per block is 13,000. The cost for gas, including maintenance and depreciation of lamps and posts is $84 per post per year, burning 2,175 hours, and it is one of the best lighted streets in America.

The City of Modesto, Cal., is lighted entirely by gas, from 126 three burner inverted arc lamps, 2 to the post, 106 feet apart. This lighting costs the municipality $60 per post per year, burning 2,175 hours; including maintenance and depreciation of lamps and posts and gas consumed, each post equipment giving approximately 1,000 candle power. Further statistics show that 35 of 50 of the largest cities of the United States are using gas for street lighting either wholly or in part.

In connection with gas street lighting in English cities, it is interesting to note that in the city of London there are 3 public gas lamps to 1 electric; in Perth, Scotland, 11 gas to 1 electric; in Aberdeen, 20; in Glascow, 22; in Dundee, 62; In Edinburgh and Leith, 9; in Manchester, 220; in Bradford, 141; and in Liverpool, 122. London has 65,000 gas mantle lamps, and about 4 years ago the entire western section of the city (Westminister) changed over from electricity to gas for the reason that the latter was considered far more efficient and economical. In fact a saving of $40,000 a year was brought about by the change to gas. There are altogether in Great Btitain, 771,016 public gas lamps. These are the figures of 1913 and show an increase over 1912 of 2 per cent.

Berlin, Germany, is lighted entirely by gas. In fact, only recently that city decided to spend $1,500,000 in installing modern gas lighting and throwing out all existing electric lamps. In Brussels, Belgium, there are 29 gas street lamps to 1 electric lamp; in Cologne and Dresden, 25 to 1; Vienna, 19 to 1; Munich, 9 to 1; and in Dusseldorf, 5 gas to 1 electric lamp.

In Paris there are 1,100 high pressure lamps and over 1,200 low pressure lamps used for street lighting purposes. The Madrid Gas Lighting and Heating Company, of Spain, has just renewed, for 20 years, its contract for lighting the city, the Municipal authorities considering gas for street illumination more desirable. This contract was obtained in spite of the fact that the electric company cut its bid 20 per cent. Rio Janeiro, Brazil, judged to be one of the most beautiful cities in the world is lighted almost entirely by gas.

The foregoing should convince the most skeptical that gas is far from a back number as a street lighting medium; and the fact that it

Street Lighting by Gas Arcs.

An English High Pressure Installation.

is so generally used for illuminating purposes is conclusive proof that it has undisputed merit.

Commercial outdoor lighting covers the installation of lamps in front of stores, amusement parks, train sheds, docks, piers, etc. From the gas company's point of view, commercial outdoor lighting is one of the best revenue producers there is, because of its great advertising value. It is constantly before the eyes of the public, which is not true of other gas appliances, such as ranges, water heaters, etc. The quantity of this lighting obtainable by the gas company depends almost entirely upon how it is gone after and how the installations are made. In many cases this class of lighting has been abused by installations improperly made; by this I mean too small pipe being used, and altogether cheap looking installations. Overloading the consumer, by installing too many lamps in front of his premises is a policy which, if followed, invariably reacts on the gas company. In the installation of outdoor lighting, there should be a uniform standard adopted. Half-inch pipe is too small, and does not give a look of permanence to the installation. Pipe not less than ¾ inch should be used, and, as far as possible, lamps should be installed at a height of not less than 12 feet above the sidewalk.

One of the large manufacturers of gas arc lamps has perfected a device for distant control of lamps, known as a mercury valve. This equipment does not necessitate the installation of auxiliary piping, wiring, batteries, etc., and is very simple and positive in operation. A by-pass cock is placed in the pipe line at a convenient point for turning on or off, and the lamp or lamps are equipped with mercury valves which work on the principle of a regulator. When the by-pass cock is shut off, only sufficient gas passes to supply the pilot light; when the cock is opened wide the full pressure goes through, raises the mercury seal, allowing the gas to pass into the burners. This equipment is recommended where outdoor arc lamps are installed and distance control desired. We must bear in mind that it is not only wise for the gas company to install superior illuminating units, but also to produce effect from an installation point of view that will be harmonious and pleasing to the eye.

Over 75 per cent. of the gas companies in the United States and Canada retain ownership of the lamps installed, which means a large investment in equipment. This equipment must produce revenue; and discontinuance of the lamps because improperly installed and maintained, results in a big investment without any return. Arc lamps installed and not used are detrimental to the company. It is a bad advertisement and brings about a condition where the lamps are depreciating and no revenue forthcoming to offset it. It is safe to assume that an outdoor arc lamp represents an investment of $15 plus a maintenance charge of say $5 per year, making the first year's cost $20. The average consumption of these lamps is 20,000 cubic feet of gas at $1 per 1,000 cubic feet, with a 50 per cent. operating ratio, possible, but not probable, which leaves $10 to take care of the investment of $20. If the lamp is removed at the end of 1 year and returned to the shop, a credit is issued covering the cost of the lamp only, or say $9.60 as invariably the pipe and fittings remain on the premises of the consumer. This leaves a loss of $10.40, with only $10 in revenue to take care of it, or a loss of 40 cents on each lamp removed. This should be borne in mind, as haphazard soliciting and lack of care in installation results in removal of lamps.

Experience shows that the most satisfactory plan to pursue in obtaining this class of business is to rent the lamps, although a few gas companies sell them outright. It has, however, been the experience of most companies that the rental plan is superior to the sale plan inasmuch as the former makes it possible for the gas company to retain control of the maintenance of the lamps, which insures them against neglect and inefficient service. Another fact worth considering is that the rental plan helps to make up for an inefficient sales force, as the ratio is about three to one in favor of the rental over the sale plan. For this class of work it is better to choose one or two of the most capable salesmen in the department as the best results are obtained by men who are thoroughly competent to explain to the consumer the real advantages to his business from the use of exterior lighting.

There is no question but that a well managed campaign for outdoor lighting will bring remunerative results to the gas company. It is possible to educate the merchants of your city to consider the necessity of lighting the exterior of their stores. In fact, good outdoor lighting should be as much a part of their store equipment as

the proper illumination of the interior. One of the basic principles of outdoor lighting is to attract attention, and when the attention of a prospective customer is secured, a sale is almost sure to result.

Spectacular lighting should be avoided as it invariably does more harm than good. Installation of outdoor arc lamps in places difficult to get at is to be avoided. The point to bear in mind at all times is to have an installation that is not only an advertisement to the consumer but the gas company as well; and it is only possible to bring this about by using great care and common sense in making installations. Even though the illumination from the unit gives satisfaction, remember that improper installation will result in a discontinuance of the lamp because of its unsightly appearance. Outdoor lighting is viewed by the passer-by not only during the night time but in the day as well. Manufacturers of outdoor lamps can supply brackets that are not only practical but also artistic, and the additional cost for such an installation is so small viewed in the light of permanent results, as to be scarce worthy of consideration. Makers are also bending every effort toward making the lamps of artistic design, and these lamps properly installed are a decided asset to the gas company, both from an advertising and revenue standpoint. Commercial outdoor lighting produces big revenue, and progressive gas companies are giving a great deal of attention to this field of the business.

High pressure gas lamps are used extensively abroad, but to a very small extent in this country; one reason for this being the high cost of maintenance and the special equipment necessary to make a successful installation. Another reason is that some low pressure lamps manufactured here equal in efficiency high pressure lamps built by foreign concerns. For example, one of the best known low pressure outdoor lamps, made in the United States, gives 50-candle power per cubic foot consumption and at very low maintenance cost. Maintenance crews are largely unskilled men entirely capable of handling low pressure lamps, but with the use of high pressure lamps skilled labor is necessary.

High pressure gas lamps are more especially used for street lighting, and in the majority of countries where they are commonly used, special mains are laid for high pressure distribution for this purpose. In the United States most distribution systems are low pressure, and to install high pressure lamps would require special equipment.

There is no question that there is a future and a big one for high pressure street lighting, but the business is yet in its infancy here, due to local conditions. Gas engineers in America are even now not agreed as to whether high pressure or low pressure gas is the proper method. There are many disadvantages in high pressure distribution as well as in the lamps used. Unquestionably greater candle power may be obtained by the use of high pressure lamps, but I would say that high pressure lighting at the present time is considered mainly as an experiment. All artificial illumination must finally be considered from a commercial viewpoint, and when we take into consideration the high cost of equipment and maintenance, I believe that most engineers will concede that the low pressure gas lamp is far more efficient at present than the high pressure. In reference to high pressure gas lighting on the Continent, it is interesting to note that the Paris Gas Company recently installed at a large assembly, sixty 4,000 candle power 3-mantle arc lamps, for the general illumination of the hall. The hall was 215,000 square feet in area, the arcs consumed 77 cubic feet of gas per hour under a pressure of 64 inches of water, and we understand that the illumination was very pleasing. For street lighting Paris has 600 high pressure lamps of from 1,000 to 4,000 candle power. The Company estimate that the cost of lighting, including the expense of compressing the gas, repairs, replacing mantles and globes, including sinking fund charges, is about 0.003 per candle power. They claim by the use of compressed gas a saving of about 70 per cent. over electric arcs for illumination.

In Berlin the 2,000-candle power high pressure gas lamps cost the city $60 installed, gas $39 per year per lamp, burning 2,000 hours; interest and depreciation are figured at $9 per lamp per year; repairs, service and maintenance $20; total cost per lamp, $68 per year. The 2,000-candle power electric lamps cost the city $181 without cables. The interest and depreciation are included in the 3 cents per Kw.H., paid to the electric plant by the city. Interest and depreciation are figured at $27; maintenance, repairs and service, $41; current consumption, $37.95; making a total of $105.95. The actual operating cost per lamp, without current consumption is $68. This shows that the cost of electric current and equipment is far higher than high pressure gas lamps. It has sometimes been said that Berlin uses gas for street lighting because the gas plant is owned by the city, and the electric plant by a private corporation; but the figures show clearly that for street lighting gas is much more economical and to be preferred to electric arc lamps.

Probably the largest installation of high pressure street lighting in North America, will be on the grounds of the Panama-Pacific International Exposition. This will consist of 300 1,100-candle power lamps, one lamp to each post, and gas pressure 2½ to 3 pounds.

In Conclusion.—One of the distinct advantages of gas street lighting over incandescent electric is the fact that it is unnecessary to install so many units in order to give the proper illumination. This is a decided advantage in as much as the appearance of the street or boulevard is more dignified when posts contain the minimum number of units. Another point worthy of consideration is that gas street lamps receive two inspections daily, when they are turned on and turned off. This doubly assures that all lamps give best service every day. This is not true of methods of lighting handled from a central control and maintenance given infrequently. These who have given the subject of street lighting much thought, agree that the cluster scheme of lighting is entirely wrong. It is spectacular, undignified and impractical, and inefficient. It does not give the light where it is needed: it is a positive detriment to a first-class business street, and wide-awake merchants are rapidly waking up to this fact because it detracts from their show windows. This system of street lighting clutters up with twice as many posts and about five times as many units as is necessary, multiplying maintenance cost, destroying the beauty of store fronts and window displays, and then only furnishing about 200 or 300-candle power. The large unit, or arc lamp, in our estimation, is the most feasible method for street illumination. This eliminates unnecessary number of posts and units, and the maximum amount of illumination is given. The logical installation is a 1 or 2 arm post, 2-arms preferred. Experience proves that the small unit from an all around efficiency standpoint, is not to be compared with the arc lamp for street illumination. Our competitors are getting away from the small unit type of illumination, and I might mention that one of the most beautiful electric installations in this country is at Washington, D. C., and this is a column topped by one large lamp.

The tendency of gas companies has been to regard street lighting only as a commercial proposition, and a field for the profitable sale of gas. I believe that street lighting should be considered as one in which the product gets the advantage of the widest public advertisement of its merits. Considered from this viewpoint, it is bound to create a greater demand for gas for all purposes.

Reviewing the whole street lighting situation, there is no question but what, in all its various forms, it produces a big revenue both directly or indirectly, to the gas company, and if we wish to hold our own in the illumination of municipalities, gas companies must make some concession in prices. Long ago the electric companies realized that this was one of its best advertising mediums and made the price of current much lower than the price charged to other consumers. Why did they do it? Because they realized that it advertised their commodity as no other form of advertising could possibly do. It brought people out at night and made them look into store windows; it was an incentive to merchants to better display goods in their windows, and incidentally interest him in better window illumination, for there is no question but what the best lighted streets are those on which the public travel. Let us reduce this whole subject to a matter of individuals. You are not going to travel a poorly lighted street if you can help it, preferring at all times a well lighted highway. Of a certainty it follows you are going to notice the kind of illuminations and if you see that gas is used, you are bound to be impressed by the fact, and it has a tendency to strengthen your belief in gas, not only as an illuminant, but also for all other purposes. Some gas companies lighting the streets of cities have reduced the price of gas to holder cost in order to obtain the business, and find that it indirectly brings big returns. Beyond question, gas for illumination is superior to any other artificial illuminant. Its light rays are soft, white and steady, and owing to the larger source give better distribution and better color value. There can never be any question about the reliability of service if gas is used. There is with electricity, for it is exposed to all the elements, and the source of supply and distribution system are more apt to be damaged.

Volume of gas output is what we are seeking and this is being brought about by a lower price per 1,000 cubic feet, and it does not take much of a prophet to see the day in the near future when gas for street lighting purposes will outrun its competitor. Do not think for one moment that this will be an easy task. It will not. But if gas men pursue a modern and progressive commercial policy, the result I have predicted will be ultimately realized.

There are always some in the gas business whose hearts are faint when they think of the future of the industry, but there is one thought which I think every one should carry home with him; that for over 100 years gas has played its part in the affairs of the world ably and forcibly, and surely, with the improved methods at our command in this age, there is no reason why we should not more than hold our own, and take the place which rightfully belongs to us in the lighting of the world.

To Exhibit at Minneapolis.

The National Commercial Gas Association, through Mr. L. F. Blyler, Chairman of the Exhibition Committee, has issued this list of those who will have exhibits at the Minneapolis convention, with the numbers of the booths assigned them:

A. B. Stove Co.....76, 77, 78, 79
Addressograph Co.....70, 80
American Cast Iron Pipe Co...18
American Gas Construction Co.
.....140
American Gas Light Journal.141
American Ironing Machine Co..44
American Meter Co.....45. 55
Backus Heater Co..... 9
Bayley & Sons..... 71
Beler Waterheater Co.....133
Blodgett, G. S., Co.....28
Chicago Clothes Dryer Co...58, 59
Chicago Flexible Shaft Co.117, 118
Clark, Geo. M., Co... ..36, 37, 38
Clow, James B., & Sons.....151
Connersville Blower Co..... 19
Crandall-Pettee Co.....30
Crane Co 98, 99
Crane, Wm. M., Co..137, 138, 139
Dayton Pipe Coupling Co... ..54
Decarie Incinerator Co.....112
Detroit Stove Works.....66, 67, 68
Draeger Oxygen Apparatus Co 62
Duluth Water Heater Co.....125
Eclipse Gas Stove Co.
.....107, 108, 109, 110, 111
Eriez Stove & Mfg. Co.....87, 88

Eclipse Fuel Engineering Co. 152, 153, 154
Estate Stove Co 25, 35
Fuller, Warren Co. 46, 47, 48, 49, 50
Gas Age 14
Gas Appliance Sales Co. of America 123
Gas Industry 119
Gas Record 116
General Gas Light Co 56, 57
General Gas Appliance Co. 23, 24
Gilbert & Barker Mfg. Co. 42, 43
Hale Gas Mixer Co. 12, 13
Harley-Davidson Co 86, 96
Hays Mfg. Co 73
Hoffman Heater Co 135
Humphrey Co 127
Johnson Gas Appliance Co 52
Life Saving Devices Co 33
Lombard Governor Co. 17
Long-Landreth-Schneider Co. 136
Lighting Journal 89
Mead Gas Heater Co 72
Manufacturers Sales Co 149
Meek Oven Co 60
Michigan Stove Co 63, 64, 65
Mueller, H., Mfg. Co 82
Minneapolis Heat Regulator Co. 15
National Commercial Gas Association 144
N. C. G. A. Educational Committee 16
N. C. G. A. Advertising Committee 97
National Incinerator Co 34
National Stove Co 74, 75
National Tube Co 114, 115
New Process Stove Co 94, 95
Nightingale Co 40
Peninsular Stove Co 142, 143
Phœnix Glass Co 92
Pillsbury Flour Mills Co 29
Pittsburg Water Heater Co. 121, 122
Pittsburg Coal Co 10, 20
Rapid Heater Co 126
Rathbone, Sard & Co 41, 51
Rector Gas Lamp Co 124
Reliable Stove Co 1, 2, 3, 4, 5
Reznor Mfg. Co 61
Ringen Stove Co 21, 22
Roberts & Mander Stove Co. 81, 91
Rosenbaum Mfg. Co 113
Rulu Gas Lighter Co 69
Rutz Gas Lighter Co 145
Ruud Water Heater Co 129, 130
Safety Gas Lighter Co 6
Shapiro & Aaronson 26, 27
Somerville Mfg. Co. 128
Spitfire Gas Lighter Co 93
Sprague Meter Co 83
Standard Oil Co 90, 100
Storrs Mica Co 106
Strause Gas Iron Co 11
Surety Attachment Co 7
Tremkamp Stove & Mfg. Co. 84, 85
Union Stove Works 53
United Lead Co 120
Van Zandt Gas Appliance Co. 31
Weir Stove Co 8
Welsbach Co 10, 102, 104, 105
Westmacot Gas Furnace Co. 134
R. Williamson & Co 32
H. E. Wilcox Motor Co. 146, 147
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Special English Correspondence.

COMMUNICATED BY NORTON H. HUMPHRYS.

SALISBURY, ENGLAND, September 15, 1914.

The War and the Gas Industry—Gas from Tar—Calorific Value: What is it Worth?

I do not hear of any instance in which the business of a British gas company has been seriously affected, one way or the other, by the European war. If anything, the demand for gas is a little greater, due to people sitting up to read the latest editions of the evening papers. There has been an increased demand for coke, as many people are storing it in view of a possible rise in price. Some of the railroad companies, in view of military requirements, have refused to carry tar, and many other lines of goods, but, fortunately, there was a good demand earlier in the year, and most gas companies sold out all their stock before the 30th of June. So no inconvenience has been created, although some works having small store wells, a poor local demand, and no access to a tar distillery except by rail, are somewhat anxious as to the future. This position is helped by the fact that almost every large distillery has its own tank wagons, having found that it was cheaper to take supplies by this medium, over a radius of 20 to 25 miles from the distillery than by rail. The usual arrangement is a small size traction engine, and a tank of about 1,000 gallons (5 tons of tar) capacity. The demand for sulphate of ammonia is always slack at this time of the year, the usual rule being to sell out in the spring, so that stocks of ammoniacal liquor are also low. If anything, the demand for this residual is above rather than below the normal.

But there is a decided check to extensions, new business, letting on hire, and anything involving additional outlay, and that for more than one reason. The issue of new capital is for the moment out of the question, and where there is no balance to the credit of capital, the question of finance becomes acute. Then the prices of all kinds of tubes and fittings are uncertain, clear glass is for the moment unobtainable at any price, and mantles for incandescent lighting have been advanced 25 to 75 per cent., according to the positions and ideas of the sellers. The higher figure is probably a prohibitory rate adopted by parties having small stocks and large obligations, and regular users have, so far, been able to replenish their stores at about the lower one. The question of the existence of a German "corner" in mantles and thorium has been strongly debated in our technical literature, and the opinions expressed differ so widely that it is useless to reproduce any of them. The increased demand will probably be met to some extent, either by British manufacturers or neutral countries, before the position becomes acute, so there is no occasion to pay panic prices. Then there is a very heavy draft on the gasfitters, mainlayers, and other outside staff, as a large percentage are either "territorials" or reservists who have gone on active service, and a substantial portion of the remainder have been sent to the works to take the place of vacancies in the retort houses. A new service or additional cooker can be delayed for a week or more without serious inconvenience, but as much cannot be said about the work in the retort house and purifier yard.

As regards supply of coal and petroleum, there has been absolutely no change, notwithstanding all sorts of reports and alarms. Fortunately, an European war is a new experience to all under 70 years of age, our last engagement being the Crimean war, 60 years ago, so there is no guiding precedent, and what might, or might not happen, is entirely a matter of speculation. As is usual in times of excitement, after dinner conversational expressions of opinion by well-known authorities become a newspaper paragraph on the morrow, and, in this way, many unfounded reports are circulated, only to be contradicted in a few days. A specimen of this sort of thing was a report made on high authority, that the effect of war would be a stoppage in the supply of petroleum from the United States. This added greatly to the embarrassments of those whose stock happened to be low, and caused considerable trouble and unnecessary expense before it was officialiy contradicted. As a matter of fact, the only hindrance to the supplies due under contract, has been brought about by the railway companies. But it is remarkable that, notwithstanding the oil scare, there has been absolutely no panic as regards coal. In this respect the strike of 1912 was not an unmixed evil, insomuch as it led to the practice of laying up 9 weeks stock, even in the neighborhood of collieries, instead of 3 days to 3 weeks, according to distance from the source of supply. It was known that two counteracting forces were coming into operation: the output would be reduced by the drafting off of the miners for active service, and the exports would be reduced. It was also said that mining operations would be hindered by the scarcity of timber props used in opening the seams of coal. Many collieries issued notices, as a matter of precaution, but in very few instances has there been any serious shortage of deliveries under contract. In fact, coal has been bought at normal prices in the open market.

The last month's experiences illustrate the great advantage of the Generator as compared with the Retort, and of liquid over solid material, at times of shortage of labor, or dislocated supply. The average outside man can take up the carburetted water gas plant at a few days notice, and work it at full efficiency, without distressing himself or tearing his hands to pieces. Many men, who on account of age or inexperience with heavy work, would make a poor show at clinkering furnaces, drawing retorts, or charging with scoop or shovel, would make competent operatives in the oil gas house. Then as to storage of material. A fair estimate of the cost of oil in the store tanks would be 3½d. per gallon, and of coal in the sheds 18s per ton. The oil does not deteriorate for gas making by keeping, is not liable to spontaneous combustion, and costs nothing for trimming. We may also assume that 2 gallons of oil equal 1,000 cubic feet of gas, and that a ton of coal will yield 12,000. A supply of coke is always available, and for storage purposes 24 gallons of oil are equivalent to one ton of coal; 7s. worth of oil are equivalent to 18s. worth of coal, a valuable consideration when working capital is low, or interest on money high. And 24 gallons of oil occupies less than 4 cubic feet of space, while a ton of coal bulks over 40. A tank 12½ feet in diameter by 16 feet high will cost well under £100, and will contain 10,000 gallons of oil, and it can usually be arranged so that the contents can be drawn off by gravity, without expense of labor, as required. A store to contain the equivalent in coal must be about 50 feet long, 22 feet wide and 16 feet high, and labor would be required both when stocking-in the coal and when conveying it to the retort house for use. These considerations, of course, apply to extraordinary conditions. Under normal circumstances, the price obtainable for the residuals from coal is a great consideration. If a return equal to half the cost of coal, or even two-thirds, can be obtained, and the higher proportion is by no means a faucy one, oil must be cheap if it is to be in the running at all. Especially is this the case where vertical retorts or stoking machinery are used, which is now without exception the rule in the larger gas works. Petroleum yields no coke, no sulphate—only a small proportion of light tar.

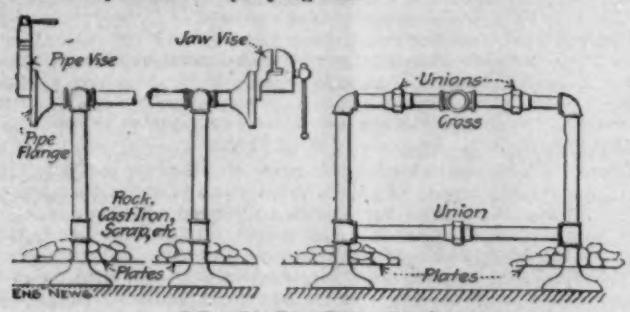
Every time there is an important rise in price, or difficulty in connection with the supply of coal, the question of the utilization of tar, either for making gas or for use as a fuel, comes forward, to disappear with equal promptitude, with a return to normal circumstances, notwithstanding the claims of efficiency and economy that are made on its behalf, and which should, if substantiated, lead to its being permanently used on the works, especially at the present prices of coal and oil. I have recently seen a published statement describing an apparatus which was used successfully during the strike of 1912, by Mr. Wyatt, manager of a small gas works on the South coast, and which is claimed to gasify 2 gallons of tar per hour, in an ordinary horizontal retort, and to yield 240 cubic feet of gas (quality not stated) per gallon of tar consumed. The apparatus used is a simple arrangement made up of ordinary wrought iron tube and connections. A center piece of ½" pipe, in length sufficient to extend nearly to the back of the retort, is fitted with a double jacket, made of 1" annd 1½" pipe, so arranged that a continuous current of water flows up the outer and returns through the middle tube, and the supply of tar is injected as required through the central ½" tube. This arrangement is inserted through a hole in the retort lid, and has the advantage that it can be inserted at a moment's notice, and removed with equal facility, without interfering in any way with the usual operations. An ordinary horizontal retort, charged with coal in the usual way, say 4 charges, 6 hours each, will produce about 6,500 cubic feet of gas from 12 cwts. of coal, at a cost of something like 12s. gross, or 6s. after allowing for residuals, in 24 hours. But according to Mr. Wyatt, its productive capacity can be increased to 11,500 cubic feet in 24 hours, and that quantity can be produced from 48 gallons of tar, which if sold in the ordinary way would realize about 8s. Unless a remarkable good price for tar is obtainable, it is evident that

these figures offer a clear case for the utilization of tar as a cheaper method of producing gas than coal or petroleum, in many gas works. There would be a carbonacious residue, pure and free from ash, equal to quite half the weight of tar used, that may be of some use as a fuel. Mr. Wyatt, amongst other conditions of working, advises that a good supply must be used in the water jacket, and that the supply of tar must be carefully adjusted, according to the indications obtained by testing with white paper at a test cock. The gas must be mixed with coal gas or there will be napthalene trouble, and if good results are wanted the manager must look after it himself. It is this last condition that usually stands in the way. A manager's other duties in the works, and in the district, do not admit of constant attention in the retort house. The arrangement described is simply an addition of the water cooler, to a process very generally used for making rich oil gas for railway coaches, lighthouses, etc., from paraffin oil, but the yield is, I believe, only about 90 cubic feet of gas per gallon, but it is worked at a comparatively low heat. Mr. Wyatt's idea appears to turn in the direction of running a temperature sufficiently high to break up the rich gas produced in the first place, and thus to obtain a large volume of comparatively poor gas.

A remarkable communication appears in the columns of the *Journal of Gas Lighting*, under the name of J. H. Fairweather. The author traverses the idea that the only sensible standard test for gas is a calorific one, or that the object to be sought for is how to obtain the greatest number of heat units at the lowest possible cost, on the ground that the calorific value, as regarded from the consumers point of view, is simply a scientific figure with no definite counterpart in practice. In effect he charges the gas undertakings with proceeding on assumed data that have never been tested by experiment. At present he considers gas undertakings and consumers alike to be largely in the dark and possibly both suffering as a result. Beyond calling attention to the matter, and suggesting the need for enquiry into many details connected with it (some of which have already received attention) he does not go, nor does he give any indication of the direction in which a better test than the calorimeter is to be sought for. He gives some considerations relative to composition of gas, with special reference to percentage of hydrogen, in the course of which assumption is by no means absent, and expresses opinions in favor of a supply pressure that would admit of a bunsen burner drawing in all the air required for combustion at the air holes, instead of something less than half. This is practically a plea for a more extended use of the high pressure system. He also has something to say about the comparative size of flame obtained on combustion of various gases, and it would appear that his views tend toward a gas of fixed composition; in short, to a test by analysis. On this point it may be said at once that the usual processes of gas analysis are much too complicated and liable to error to be suitable for a legal test, but at the same time it is possible that gas engineers might, with advantage, give regular attention to the composition of the article they supply, as many of them already do.

New Methods and Appliances.

A PORTABLE PIPE FITTING BENCH.—A fitters' bench that can be quickly knocked down or set up by unscrewing or screwing 6 unions is illustrated by the accompanying cut.



Collapsible Pipe Fitters Bench.

The legs are loaded with stones or scrap material as shown to make the bench firm. The dismantled bench occupies but little space. Boards can be placed lengthwise on the top of it, making it adaptable to many uses.

Recent Patent Issues.

Prepared for the AMERICAN GAS LIGHT JOURNAL by ROYAL E. BURNHAM, solicitor of patents and counselor in patent causes, 833 Bond Building, Washington, D. C., from whom illustrations and specifications of any patent mentioned below may be obtained for 20 cents.

1,110,320. Gas Relief Valve. L. B. Fulton, Pittsburgh, Pa, assignor to Chaplin-Fulton Mfg. Co., same place.

1,110,372. Gas Producer. T. B. Benner, Cortland, N. Y.

1,110,413. Apparatus for Measuring the Flow of Fluids. T. B. Wylie, Pittsburgh, Pa.

Items of Interest
FROM VARIOUS LOCALITIES.

THE Huntsville Consolidated Gas Company, Huntsville, Ala., has been incorporated with a capital stock of $500,000. The officers are T. W. Pratt, President; C. M. Erwin, Vice-President; E. C. Dillon, Secretary and Treasnrer. It controls the properties of the Huntsvilie Gas Light and Fuel Company and the New York-Alabama Oil Company.

MR. FREDERICK I. SPEAR, formerly Manager of the Fort Wayne (Ind.) Gas Company, has been appointed Manager of the Mt. Clemens Gas Light Company, a subsidiary of the American Public Utilitities Company, to succeed Mr. G. W, Briggs, resigned.

THE Ludlow Valve Company has received large orders from the British Admiralty for high pressure valves, to be installed in the new warships now building. In addition to the navy order, others have been received since England engaged in the present war, from various corporations and concerns throughout the British Isles, and these orders will keep the Ludlow works busy for some time to come, as the shipments abroad will represent many tons. The war has resulted in the closing of many valve works in England, and as a result the British Admiralty and the concerns in Great Britain are forced to place their orders outside their own country. In placing them the Ludlow Valve Company has been very generously favored.

BISMARK, N. D., wants gas, and Mr. F. E. Ployhar, of the Valley City Gas Company, has asked for a franchise to supply it. He offers to supply gas at $1.65 net to start with, and upon a basis of consumption grades the rates as low as $1.45 per 1,000 cubic feet. A bond of $1,000 is offered which probably will be increased if the commissioners see fit to grant the franchise. Under the terms of the franchise, work is to start on the plant June 1, 1915, and be completed by Oct. 1, 1916.

AT the annual meeting of the stockholders of the Worcester, Mass., Gas Light Company, Charles D. Lamson, A. George Bullock, F. H. Dewey, Dr. Samuel B. Woodward. Thomas B. Eaton and George Crompton were elected directors, and De Witt Clinton Clerk and Treasurer. At a subsequent meeting of the Directors, Mr. Lamson was reelected President and Mr. Dewey Vice-President. Mr. Lamson has been President of the company since 1888. The annual reports showed that during the past year the company did the biggest business in its history. The increase in output was 4 per cent. greater than last year.

FORTY members of the Wilmington, Del., Gas Study Club attended the last meeting. Thomas M. Newell gave an interesting description of the workings of the New Castle governor and of the laying of the high pressure lines and the proper way to avoid trouble in the main connection with the governor. After the discussion which followed the address, a solo was sung by W. A. Conway, with an accompaniment by W. J. Conway at the piano. W. J. Bannard and John H. Stickle gave the members an exhibition of pocket billiards.

THE Haverhill (Mass.) Gas Light Company have just held a very successful demonstration of gas cooking in their salesroom on School street, Merrimac. There was a large attendance, some 200 ladies and gentlemen taking advantage of the opportunity to learn how you can do your cooking without dust and dirt. The demonstration showed the possibilities of the gas oven by cooking all at the same time, sponge cake, biscuits, macaroni and cheese, broiling fish and baking potatoes. The thing that seemed to strike the ladies as most peculiar was that the lower oven door was left wide open during the broiling. They also gave an exhibition of tank water heater, room heaters, gas irons and other small appliances. The Merrimac Mandolin Club played during the evening.

A CONFERENCE was held recently between City Attorney Stephens, of Los Angeles, Chief Engineer Mulholland and Roderick MacKay, chief mechanical constructor of the Los Angeles aqueduct, regarding plans for making a valuation of the plant of the Los Angeles Gas and Electric Corporation for use of the city in litigation over gas rates. Mr. MacKay was instructed to perfect his organization, and the City Council will be asked to provide for the employment of the men desired.

THE Alton (Ill.) Gas and Electric Company are inaugurating a coke campaign in which they propose to send a representative to every prospective buyer, inspect his furnace or stove, see if it is fitted for burning coke, and if so to give instructions. If instructions are followed, and still the coke is not satisfactory, the proposition is that the purchaser need not pay for it.

MR. J. M. MONCREIFF, of Bloomington, Ind., has been selected to succeed A. W. Higgins, as manager of the La Crosse Gas and Elcctric Company. Mr. Higgins has been transferred by the American Public Utilities Company, to Indianapolis, there to be President and General Manager of the gas and electric company. The properties there include the largest central heating plant in the world, and the election of Mr. Higgins for the position is a decided compliment. Mr. Higgins, only a few months ago, succeeded Mr. Thurston Owens as Manager of the La Crosse Company.

A CHARTER has been filed at the State Department, Dover, Del., for the Central Ohio Gas and Electric Company, capital stock $2,500,000 The objects and purposes are to acquire oil and gas lands in Ohio and Western Pennsylvania, to operate gas works, to generate and purify gas, to lay pipe for the extension of gas, etc., to erect, maintain and operate reservoirs, ducts, etc. The charter was filed by New York parties who recently formed the Cities Public Service Corporation with $60,000,000 capital stock. The incorporators who filed the char ter were local Dover parties, M. M. Hirons and Walter P. Carrow.

"N," WRITING from Wheeling, W. Va., says: The war has relieved the Board of Control of considerable anxiety and has also solved the question "when will the city gas works be closed down?" Several months ago the board announced that the plant would have to be closed if the price of oil continued to advance. To-day oil is selling at greatly reduced prices and the plant is operating at a profit. This much has been decided—as long as the war in Europe continues the gas works will operate. As a result of the war, oil refiners have only limited markets for their products and they are glad to unload large quantities to communities where oil is used in manufacturing "water gas." Wheeling has a $100,000 water gas plant, hence the anxiety.

THE German-American Coke & Gas Company, of Hartford, Conn., has filed a certificate of acquisition of its own stock in the office of the Secretary of the State. The Company has bought 3,150 shares, according to the vote of stockholders controlling more than three-fourths of its outstanding capital stock at a meeting held August 3. The certificate is signed by Vice-President Louis Wilputte and Treasurer Robert C. Metcalfe.

A DELAWARE charter has been granted the Gas Products Company, Philadelphia, with capital stock of $1,000,000, to purchase, own and acquire inventions, patent carbon burners and deal in water heaters, etc. The incorporators are F. R. Hansell, Philadelphia, and S. C. Seymour and George H. B. Martin, Camden, N. J.

TROUBLES never come singly! "T. R.," sends this from Cambridge, Mass.: Isaac T. Haddock, chemist for the Cambridge Gas Light Company, who was married to Miss Jennie L. Brackett, an employee of the company, on Wednesday, drove up to the Shepard Memorial Church, Garden street, on Tuesday night, with his bride-to-be, ushers and one or two guests, for a rehearsal of the wedding ceremony. Mr. Haddock left his automobile near the church, and was much chagrined on coming out after the rehearsal to find that the machine had been stripped of two automobile tires. He reported his loss to the police.

A REPORT from Columbus, O., says that the Welsbach Company has reopened its plant there, closed about a year ago owing to unfavorable tariff. It is expected that the plant will be in full operation by October 1, employing 500 hands. The plant at Gloucester, N. J., has been placed on full winter compliment, employing 1,300 men.

AFTER the business session at the last meeting of the Brockton (Mass.) Gas Light Employees' Association a social session was held, and former Manager H. K. Morrison was presented a diamond stickpin. Mr. Morrison has moved to Lynn. Remarks were made by Business Manager E. B. Mooney and Mr. Morrison. A buffet lunch was served under the direction of Messrs. E. B. Mooney, William P. Morton, Wilfred Jordoin, Mark Fitzmaurice, J. J. Sheehan and Dennis J. Buckley. Part of the entertainment was furnished by Churchill and Adams of Boston, who gave vocal, piano and violin selections. Miss Purcell, of Boston, rendered several vocal selections and entertained with dancing, and Miss Gertrude Susa played violin solos and sang. Jack Seitzer gave vocal solos and a monologue, and Frank Feilding cornet solos. Charles M. Burke also played cornet selections and several piano solos. Edward Jordan gave fancy dancing. Mr. Mooney and Mr. Morrison sang a duet. James P. Moran gave several baritone solos. The entertainment was in charge of Messrs. Leon Curtis, Charles Bush, Jean LaRoque and Hector Mongeau.

THE jury in the case of Philip Thomas and Peter Alexander, of Hinsdale, N. H., formerly of Brattleboro, against the Twin State Gas and Electric Co., seeking to recover damage for alleged shutting off of gas in the store of the plaintiffs on a Saturday night in 1909, returned a verdict for one cent damages. As the defendant company had an offset claim against the plaintiffs in the form of a note of $231, the verdict is virtually in their favor for the face of the note.

SOME English gas companies have posted this notice to their employees: "The company bring to the notice of all single men in their employment between the ages of 19 and 30, who are physically fit for military service and who have not yet volunteered, the present urgent need of their country. Those who do not volunteer for service are liable to be immediately called upon to relinquish their employment with the company, in favor of ex service men and men too old for active service." This was accompanied by an announcement of the arrangements made by the company as to the allowances to Reservists, Territorials and Recruits. The wives of those absent on active service will receive half the pay of their husbands, up to a maximum of 15s. per week, and an additional allowance of 1s. 6d. per week for each child under 15 dependent upon the mother. Aged parents or dependents or motherless children of men on active service will receive allowances. Upon return from active service, each employee will be reinstated in the position he formerly held with the company; and single men on their return will receive a cash bonus of not less than £5.

"THE gas rates of the Seattle Lighting Company are under investigation by the Public Service Commission of the State of Washington. The Seattle Lighting Company is conrolled by the Dawes Brothers, of Chicago, who have engaged Henry I. Lea and his assistants to prepare the valuation, audit and rate schedule studies required."

MR. JOHN J. CREEDEN, for 20 years a valued employee of the Consolidated Gas Company, of New York, died on the 14th inst., at his home in this city, after an illness of some 6 months. Mr. Creeden has been connected with the General Fuel Appliance Degartment of the Company since its organization 12 or 13 years ago; and his activity in connection with the Appliance Expositions of the National Commercial Gas Associations in New York city, will be recalled by those who worked on the shows. His associates mourn the loss of a lovable man, and the company have lost a faithful worker.

THE Pacific Coast Gas Association staged a very good appliance show during its convention at Long Beach, Cal. The following firms had displays: Space 1, Welsbach Company; 2, Trenkamp Stove and Manufacturing Company; 3, James Graham Company; 4, W. F. Boardman Company; 5, Carl Otter Sales Company; 6 and 7, Cass-Smurr, Damerel Company; 8, H. Mueller Company; 9, Ruud Water Heater Company; 10, General Gas Light Company; 11, Humphrey Water Heater Company; 12, Cole Manufacturing Company; 13, Hoyt Heater Company; 14, Bacon Light Company; 15, George M. Clark Company; 16, Walter Guyot; 17, Best's Stove Company; 18, Merritt-Goodrich Company; 19, Eclipse Gas Stove Company; 20, Steeker and Kerr Stove and Foundry Company; 21, Taylor Instrument Company; 22, Los Angeles Gas and Electric Corporation; 23, Metric Metal Works; 24, Pittsburg Water Heater Company; and 25, Sprague Meter Company. The exhibition committee were, C. B. Babcock, H. P. Pitts, I. J. Thompson, B. S. Pederson and Paul E. Haugh.

MR. W. S. GUITTEAU has been made Sales' Manager of the Lloyd Construction Company, an advancement earned by service. However, you will find him "the same old Bill."

Utilities Commission News.

INDIANA COMMISSION REPORT.—The summary of the work of the Public Service Commission of Indiana for its first 15 months, ended July 31, shows 913 regular proceedings and 1,727 informal. More than 20,000 schedules of rates and tariffs were filed. Of the regular proceedings 220 involved rates, 113 stock and bond issues, 40 station facilities and 29 the purchase and sale of utility properties. The Chairman said that one of the greatest tasks has been completed—the compilation of a complete list of the utilities under the Commission's jurisdiction. The annual report of the Commission shows that rates of utilities vary greatly. The summary of the report, made by the Chairman, declares that rates are grossly discriminatory. The prices for water range from 6 cents to 60 cents per 1,000 gallons; electric energy, from 5 cents to 15 cents per kw-hr.; gas, from 55 cents (Indianapolis) to $1.50 per 1,000 cubic feet. The Chairman said: "More than $36,000,000,000 is invested in public service corporations in the United States, over one-fifth of the wealth of the nation. Those operating in this State represent an investment of over $2,000,000,000. The control and regulation of these properties is a momentous task, and the future presents increasing difficulties. The regulation of public service corporations is neither unusual nor unjust. To establish a maximum rate of earnings on investment in utility properties is no more arbitrary than to establish a maximum rate for money lenders. The people of the State have no more vital interest in any subject than in the public service corporations that provide the necessities of life and the means of communication and transportation. Every State in the Union but two has some form of commission regulation of public service corporations. No State that has enacted such a law has yet repealed it. The necessity of the law is not only for the protection of the public from the extortions of the utilities, but it is of great value to the utilities themselves, in that it seeks to secure friendly co-operation between the utilities and the users of their service.

LONG ISLAND FRANCHISE.—The up-State New York Commission has approved the franchise of the Consumers Gas Company to construct a plant for the sale of gas in the towns of Southold and Riverhead; and to erect a plant and lines for the sale of electricity in the town of Southold. The franchises are made to include all the villages of the towns of Southold and Riverhead, except that electric current may be transmitted but not distributed through the territory bounded by Bowery Lane, Long Island Sound, Mill Creek, Peconic Bay and Jockey Creek; and except that the gas franchises are not good for the same territory or for the village of Greenport. The villages which will get service include Mattituck, New Suffolk, Cutchogue, Peconic, East Marion, Orient, Southold, Riverhead, Aquebogue and Jamesport.

OHIO ACCOUNTING SYSTEMS.—Messrs. Nau, Rusk & Swearingen, public accountants of Cleveland, have submitted to the Commission a system of accounting for utility companies. The system contemplates the division of properties into four general classes. The smallest class, D, includes all those companies having an annual operating revenue of $5,000 or less; class C comprises those having an annual operating revenue exceeding $5,000, but not more than $25,000; class B, those having a revenue of over $25,000, but not exceeding $75,000, and class A, all those whose annual revenue exceeds $75,000. Any company may use the system prescribed for the next higher class and may subdivide the accounts, as given in the system, to any extent that may best suit operating conditions. When the system is printed it will be distributed to all companies interested for their suggestions and criticisms. At present the plan is in tentative form. This system will provide for municipally owned as well as privately owned plants. In applying the plan to municipal plants, the city owning a plant will be charged with an investment which will compare with the stock of a private corporation. An accounting will be made for a return on this. Accounts will also show the free service rendered and the free service received in the same manner as if such services had been sold or purchased. Taxes also will be shown, as if the plant were paying the same rate demanded of a private corporation.

A ONE-DOLLAR MINIMUM.—A decision authorizing the West Coast Gas Company to establish a uniform minimum rate of $1 a month has been handed down by the California Railroad Commission. The Company is also permitted to charge $1 for making connections, but agrees to refund this sum, with interest at 6 per cent., when the patron has received service continually for 1 year.

Financial Notes.

IN its order approving the financial plan of Pacific Gas and Electric Co., the California Railroad Commission authorized the company to capitalize its sinking fund requirements by the issue of common stock at par. This is rather a new policy in regard to sinking funds, but is in accord with the opinion of many accountants and of several state commissions. In the application first filed by the company it was asked that part of the proceeds from the sale of the 6 per cent. first preferred stock of the company be applied to this purpose. When it was pointed out that this would mean, at the price of 82½ for the new stock as fixed by the Commission, that for each $1,000 bond retired by the sinking fund, $1,250 of first preferred stock would be issued, the application was amended by providing for the issue of common stock at par to reimburse the treasury for sinking fund expenditures. The Commission then approved the issue by the company of $1,159,823 common stock for sinking fund purposes. Of this $40,760 is for reimbursement of money expended for sinking fund from January 1, 1914, to April 30, 1914; $394,375 to provide for meeting sinking fund payments due and unpaid; $724,687 to provide for retirement of bonds through sinking fund from April 30 to Dec. 31, 1914.

THE gas operating subsidiaries of Massachusetts Gas have filed their annual reports for the year ended June 30, with the Gas Commission. Combining the four companies, the result is as follows;

	1914.	1913.
Gross earnings.....	$6,026,537	$5,689,642
Operating expenses.....	4,465,066	3,961,067
Operations, net.....	$1,561,471	$1,728,575
Other income.....	29,509	21,107
Total net.....	$1,590,980	$1,749,682
Interest.....	190,005	152,737
Sur. for div.....	$1,400,975	$1,596,945

The operating ratio was increased from 69.6 per cent. to 74.1 per cent., principally owing to the increased cost of gas oil. This, however, has been obviated in the present year by a new and more favorable contract. Concisely, the four companies saved 28 per cent. of their gross for dividends in 1913, but the best they could do in 1914 was 23.2 per cent. All of the companies except Quincy reduced their dividends in 1914, and the total dividends paid to Massachusetts Gas in 1914 were $1,342,768 as compared with $1,510,964 in the preceding year.

DIRECTORS of the United Gas and Electric Corporation announce the suspension of the semi annual 3 per cent. dividend on the first preferred stock. The amount of this stock outstanding is $9,285,000. In taking this action the directors asserted that because of the financial situation, it was deemed advisable to conserve the corporation's resources.

THE American Gas and Electric has declared the regular quarterly dividends of 1¼ per cent. on the preferred stock and 2 per cent. on the common stock. The common dividend is payable October 1 to stock of record September 21. The preferred dividend is payable November 2 to stock of record October 21.

THE Havana Electric Railway, Light and Power Company, which is a corporation formed about a year ago by the fusion of the Havana Electric Railway Company and the Cia de Gas y Electricidad de la Habana, both American corporations, has arranged for a new issue of $25,000,000 five per cent. bonds for the purposes of refunding the outstanding bonds of the two constituent companies, amounting to approximately $18,000,000, and of providing capital for improvements.

THE Utah Securities Corporation has purchased from Oregon Short Line Railroad, its holdings of common and preferred stock (approximately 98 per cent. of the total) of the Utah Light and Railway Company, and the transfer of the properties has been made. The owners of the minority stock of Utah Light and Railway Company have the right to sell their holdings to Utah Securities Corporation on the same terms as those accepted by the Oregon Short Line railroad. Payment for the stock owned by Oregon Short Line Railroad has been made partly in cash and partly in securities. The properties purchased consist of electric light and power and street railway properties in Salt Lake City and vicinity and electric light and power and gas properties in Ogden. The electric and gas properties serve in excess of 29,000 customers. Gross earnings of all divisions for the last 12 months were approximately $2,750,000.